AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Class "D" Deep Well Pump of the C. P. R. R.

The engravings on pages 1 and 2 representing this pump are made from blue prints furnished us by A. J. Stevens, General Master Mechanic of the Central Pacific Railroad. Mr. Stevens refers to these prints as follows:

"In your issue of May 16th, Vol. VIII., No. 20, I notice a cut and description of a deep well or artesian pump, built by the Davidson Steam Pump Co, No. 77 Liberty Street, N. Y., which appears to be a very good piece of machinery, and undoubtedly is.

"I send you on roller by mail, to-day, a blue-print copy showing design and construction of a deep well pump, such as we have been building since 1874. This print is taken from a drawing of the smallest size pump that we build. We have manufactured pumps from the same designs, but very much larger, some of them working to a depth of 1,300 feet. They have always performed well and given good satisfaction.

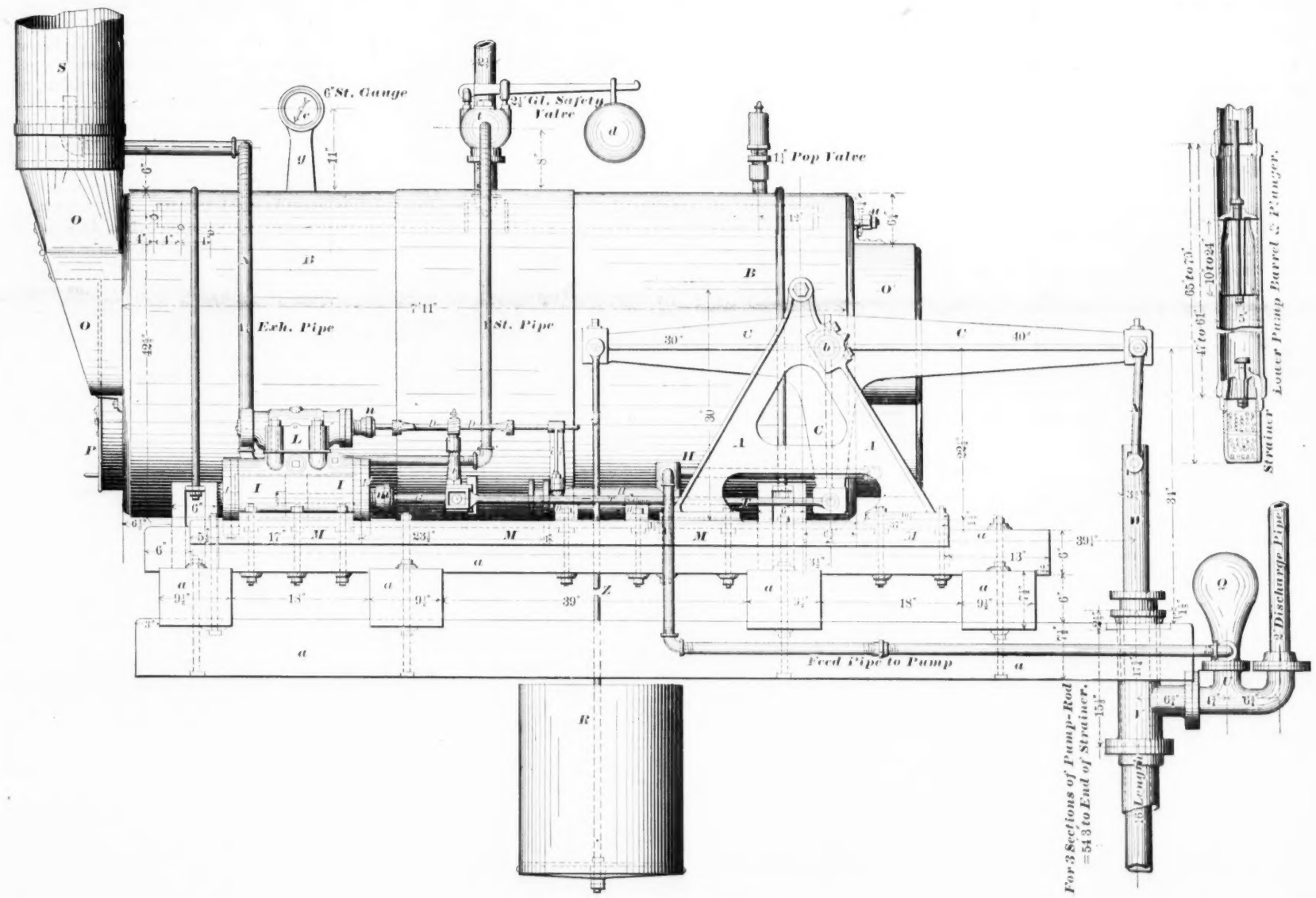
"The pump is mounted on a frame, and the frame is set in proper position over the well. It is not necessary to move the frame or machinery to take the pump and piping out of the well; simply disconnect the walking beam from the plunger, tip it up out of the way, and the pump, pipe and everything will come through the frame readily. I think the blue print will show this."

The pump shown has a steam cylinder 6″ diameter and 12″ stroke, and pump 5″ diameter and 24″ stroke. The boiler is 42″ diameter and 7′ 11″ long. Dimensions, figures and explanations will be found on the engravings, which, with the following, will give a correct understanding of the whole:

INDEX TO PARTS.

A A, A frames; *B*, boiler; *C*, bob beam; *D*, valve rod; *E E*, tappets; *F*, cam; *G*, piston rod; *H*, feed pump; *I*, steam cylinder; *J*, front cylinder head; *K*, back cylinder head; *L*, steam chest; *M*, bed-plate; *N*, exhaust pipe; *O*, boiler breeching, front; *O′*, boiler breeching, back; *P*, fire door; *Q*, air chamber; *R*, counterbalance bucket; *S*, smoke-stack; *T*, connecting rods; *U*, goose neck; *V*, upper pump barrel; *W*, upper pump plunger; *X*, connections; *Y*, A frame thimble; *Z*, counterbalance rods; *a*, timber frame; *b*, bob beam shaft; *d*, safety valve weight; *e*, steam gauge; *g*, steam gauge stand; *h*, cross-head; *i*, valve-rod guide; *m*, steam cylinder stuffing-box; *n*, steam chest stuffing-box; *t*, safety valve; *u*, hand hole.

The above letters, with explanations on engravings, include all the principle parts.



ELEVATION OF DEEP WELL PUMP.

It is the writer's intention to give in these papers a general description of the principal parts of the modern locomotive, illustrating the same by good and correct drawings, and describing the improvements that have otherwise been added.

Since all these illustrations represent separate parts of the modern locomotive, and since some of them will be arranged in a tabular form (an arrangement the writer has not seen in any book, and consequently believes to be new), we trust that these illustrations will be appreciated by the professional designer, and by the young designer in particular.

In order to make the reading of these papers profitable to the mechanic, we will, in connection with the illustrations, give should any of our friends find fault with the practical method of treating this subject, we would kindly remind them that these papers are intended for a large class of readers—for the mechanic and engineer in particular—and not for a favorite few.

When a comparison is made between the locomotives built recently and the locomotives in use about ten or twelve years ago, a change in their construction and in their appearance will be noticed. This change is due to the desire of railroad managers to reduce the cost of transportation of passengers and freight, and to a great extent this desire has been realized.

In former times it has always been the custom to place an engine in the hands of one engineer, and whenever the engine was

Modern Locomotive Construction.

BY J. G. A. MEYER.

FIRST PAPER.

In late years a change in the management and treatment of the locomotive has taken place on some of our principal railroads. This change necessarily caused also a change in the construction of the locomotive, besides other improvements that have been added to it from time to time.

rules relating to the proportioning of the parts in as plain and simple language as we can command, so that any one engaged in the building and running of the locomotive may easily understand these rules. We also hope that the description of the locomotive, which is almost inseparable from a subject presented in a manner as we propose to do, will prove interesting to the ordinary reader,

Should any of our professional friends pronounce the rules given as something superfluous, because they may be found in the many excellent books already published, or

attached to a train this same engineer had his hand on the throttle lever. When the trip was completed, the engine was carefully housed and cleaned, and, so to speak, was put to rest. In fact, we once heard an engineer say (and we have reason to believe that he was in earnest) that engines needed rest as well as engineers, because he noticed that his engine never worked as well when nearing the end of a trip as it did when starting. If this engineer is still among the living, he must either have changed his opinion or since stepped off the footboard to stay off. The trips also were comparatively short, and generally the trains comparatively light. Indeed, when we carefully consider the management of the locomotive and the treatment it received in former times, we might almost conclude that the locomotive was looked upon as a delicate piece of machinery that needed extraordinary care to keep it in good working order.

But now, mark the change of treatment of the engine that has taken place on some of our best railroads. Notice, for instance, on these roads the modern freight locomotive as it starts off with as heavy a train as it can possibly haul on a trip of great length, the engineers relieving each other at designated stations, instead of one engineer having charge of the engine during the whole trip, as in former times; notice also the scanty accommodations, if any, for cleaning or housing the engine when the trip is completed; the short time the engine is allowed to stand still after it has been examined and found to be in good working order; the heavy train it must haul on the homeward journey, run by any engineer that is competent to run an engine, and when the starting point has been reached, no time is lost in coupling it to another train, and thus it is kept running almost continually in all kinds of weather and storms. Compare this treatment to the former and the change must become apparent.

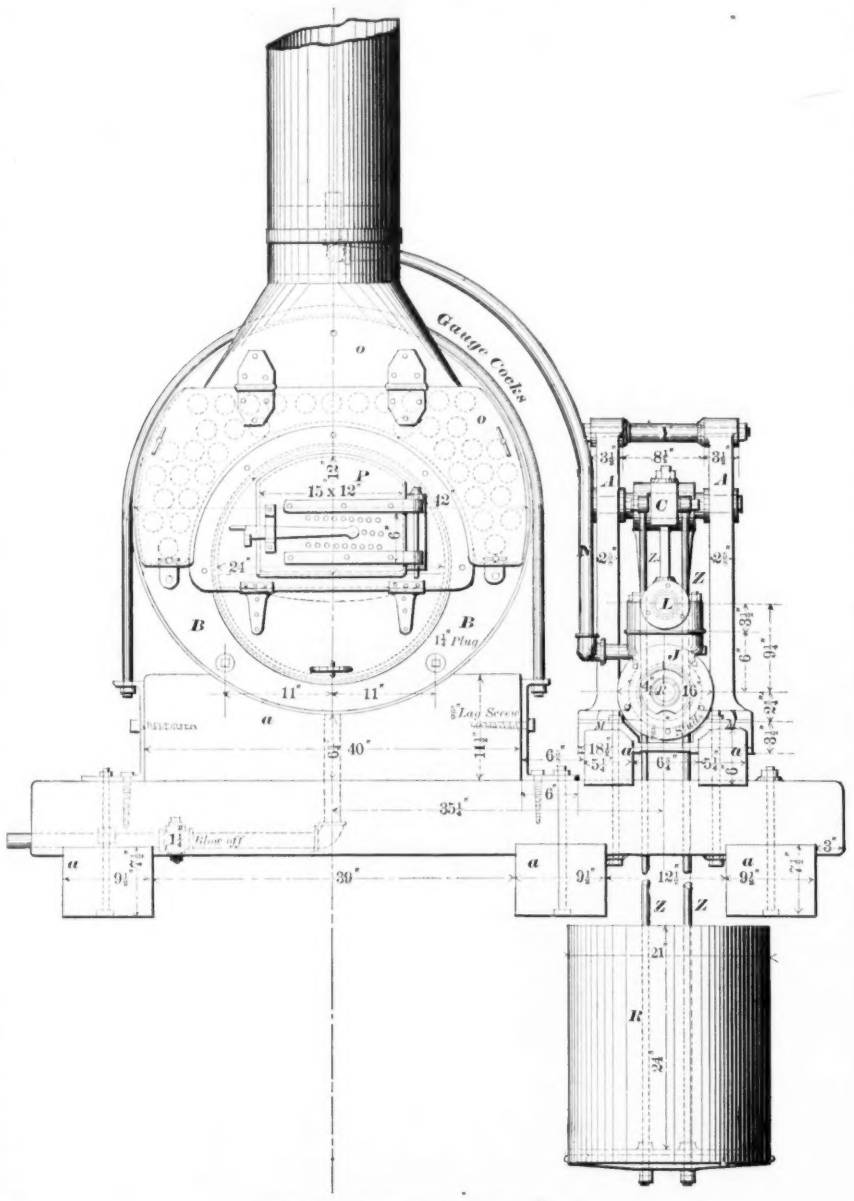
The passenger engines are sometimes subjected to the same severe treatment, but generally an engine is placed in the charge of only two engineers, one of these running the engine during one trip, and the other engineer having charge of it during the next trip, and so relieving each other alternately.

Allowing different engineers to run the same engine has this advantage, namely: that only competent engineers can hold their positions, because after a competent engineer has once shown what the engine can do, the other engineers must make the engine perform a like amount of work in the same time, or give good reasons for not doing so. Here then we perceive that no incompetency is admissible.

The passenger trains are also heavier now than in former times, and the trips longer. Generally speaking, all engines are now required to do more work than formerly. Engines placed in such severe service must naturally be strong, powerful and durable, well put together, bolt holes reamed, bolts turned and fitted, and driven with a heavy hammer. In the modern locomotive the boiler is larger than in former engines, the frames and cylinders are heavier, and generally all working parts are made stronger. In the appearance and outside finish of the engine we also notice a decided change. For instance, the landscape paintings and pictures of birds and horses on the side of the tender, have of late disappeared, and the tanks are plainly painted with good paint, and well varnished.

This is, in the writer's opinion, as it should be, because pictures on the side of the tank seem to him to be out of place. A tender is made for the purpose of carrying water and fuel, and is ill-adapted for a picture gallery. The brass finish on the engine, and fancy ornaments such as eagles, etc., are also things of the past, because these required too much time and expense to keep clean and in good condition.

From these remarks the reader must not conclude that in former times the engines had a better and more pleasing appearance. This is not the case, because years of experience have exposed faulty constructions in former locomotives, which have been corrected and otherwise improved in the modern engine, and since correct construction and distribution of metal must always improve the appearance of a machine, we conclude that our American locomotives as now built (although by no means perfect) possess elegance in form, compactness in the arrangement of the different pieces of mechanism and gracefulness in movement.



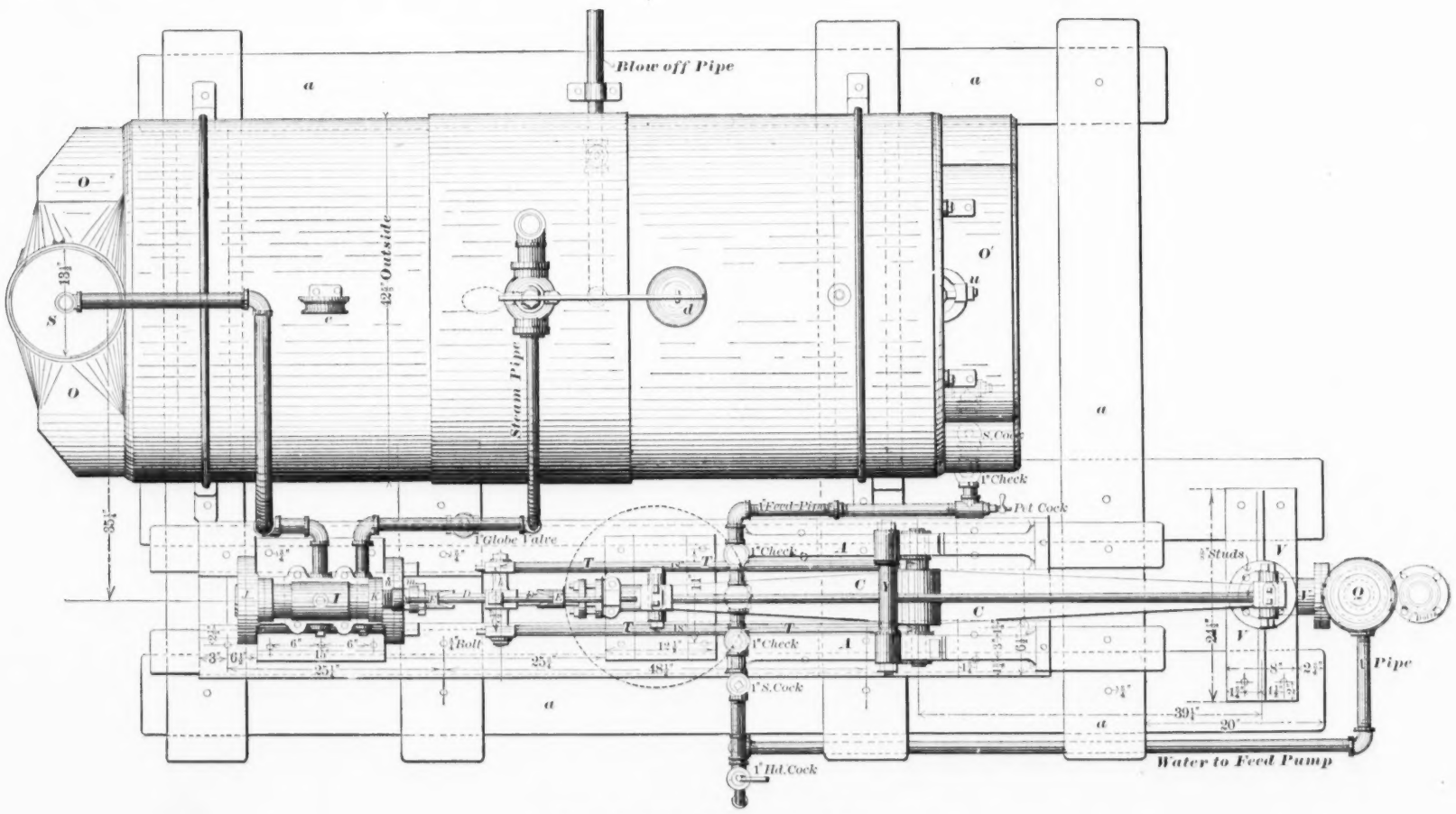
END VIEW OF DEEP WELL PUMP.

Defects Found in One Month's Inspection of Boilers.

The work of the Hartford Steam Boiler Inspection and Insurance Company continues to be not only very extensive, but very thorough. Here is a summary of the inspection work for February last, with some good advice about boiler feeding apparatus, which we take from *The Locomotive:*

"The number of inspection trips made during the month of February last was 2,898, the total number of boilers examined being 5,366. The number of boilers inspected internally was 1,356; 237 others were tested by hydrostatic pressure, while 42 were found unsafe for further use, and were condemned. 3,627 defects were reported, of which 520 were considered dangerous. The usual tabulated statement of defects is given below.

Nature of Defects.	Whole number.	Dangerous.
Cases of deposit of sediment.	369	31
Cases of incrustation and scale.	358	29
Cases of internal grooving.....	21	2
Cases of internal corrosion.....	128	9
Cases of external corrosion.....	265	39
Broken and loose braces and stays.....	51	22
Settings defective.....	199	29
Furnaces out of shape.....	79	18



PLAN OF DEEP WELL PUMP.—*See page* 1.

Nature of Defects.	Whole number.	Dangerous.
Fractured plates	102	48
Burned plates	82	31
Blistered plates	215	6
Cases of defective riveting	606	54
Defective heads	19	7
Serious leakage around tube ends	506	95
Serious leakage at seams	233	32
Defective water gauges	105	8
Defective blow-offs	35	11
Defective feeding apparatus	1	0
Cases of deficiency of water	15	4
Safety valves overloaded	34	9
Safety valves defective in construction	53	18
Pressure gauges defective	146	18
Boilers without pressure gauges.	6	0
Totals	3,627	520

"The feeding apparatus for boilers should always receive the closest attention, in order that it may not become inoperative, for, if this happens, it is evident that the boiler *must* be stopped until it can be put into working condition again.

"Fortunately, there are, at the present time, almost any number of perfectly reliable boiler feeders, both pumps and injectors, which are offered for sale at such reasonable prices that no excuse can be made for running a boiler with any sort of a makeshift apparatus. Of course, the representative of every pump or injector thinks, and will stoutly maintain, that his article is the very best that ever was or can be designed for the purpose; but, leaving off, which we may safely do, all extravagant claims, there still remains sufficient merit in any of the well-known pumps or injectors for all practical purposes. They will *all* feed boilers well if properly handled and cared for.

"It is always well, and almost a necessity in establishments of any considerable size, to have duplicate and independent feeding-apparatus for the boilers, so that either may be used if the other fails, or it becomes necessary to make repairs. This will save many hours of night or Sunday work, which is always expensive.

"A satisfactory arrangement of pipes is always possible at a small expense; in fact, a good arrangement is nearly always cheaper in first cost than some of the very complex Chinese puzzles which are sometimes found, and are called systems of piping. Lack of system would better describe some of them."

The Clearance of Cutting Tools.

BY FRANK H. RICHARDS.

Mr. E. C. Bartlett, May 30, makes kindly allusion to my recent remarks upon "Grinding and Using Cutting Tools," and I feel duly flattered and grateful; and then he proceeds to lay upon me a task that might well tax the energies of a stronger man. He asks me to be honest. Many an individual, at the close of a long and ornamental career, finds that he has failed to achieve that. But no one shall ask me a favor through the columns of the AMERICAN MACHINIST that I will not do my utmost to grant. I will, then, for this occasion at least, and for the gratification and edification of Mr. Bartlett, try to be honest.

I will say that I have more than many times had a tool cut up rough both when a screw was nearly finished and at earlier stages of the process. I have had many a fight with a tool that would not do as I wanted it to, and honesty compels me to say that I have been very uniformly victorious. Of course, to-day my practice is in accord with my best knowledge, or I would be a fool not to change for anything I know to be better.

I have learned more than many, probably more than most, machinists, judging from their practice, the great importance of maintaining a minimum of clearance under the cutting edge of a lathe tool, whether a thread tool or any other. It is a point certainly of more importance than most lathemen appreciate. It is of importance first of all in sustaining the edge of the cutting tool against wear. Other things being equal, a tool with the least clearance will last much longer than one which has excessive clearance. Sometimes in cutting very hard metal, I have found the question whether the job were possible or impossible to turn entirely upon the amount of clearance the tool possessed. I have more than once found a man unable to cut hard metal with a tool having great clearance, who has succeeded in cutting the same metal when a lazy habit of grinding has reduced this clearance to a minimum. A man, when he has a tool dressed and first grinds it, should get the cutting and clearance angles just as he thinks—better say just as he knows—to be best for his work, and successive regrinding should not change these angles. As a sample, take a square-nosed or any other end cutting tool, the profile of which will most plainly and simply show what I mean. Say that we first grind it according to the outside lines in Fig. 1. The successive regrindings would then be represented by the series of dotted parallel lines, and the tool would cut as well at last as at first. Any machinist can appreciate and admire a sharp, clean, smooth-cutting tool, and some "machinist" is very likely to do this tool the honor of borrowing it. He will probably grind it according to a series of lines like this,

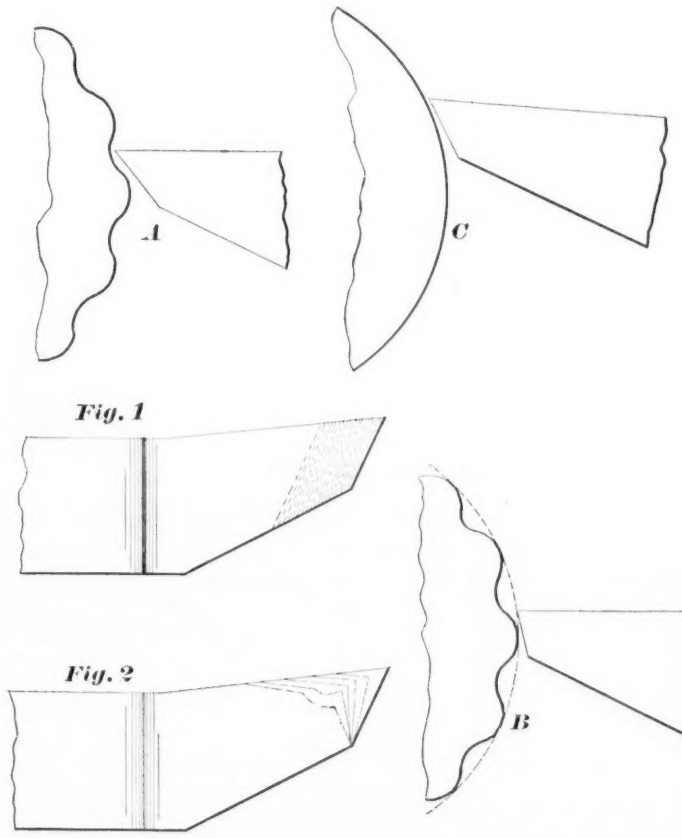


Fig. 1

Fig. 2

Fig. 2. This is a mode of grinding that is as common as it is vicious and exasperating. Any one is capable of judging for himself by which mode of grinding the tool shall attain to long life, unimpaired usefulness to the last, and a career of general respectability; and under which system the jaunty vigor of youth will be followed by continual deterioration, premature imbecility, and ignominious collapse at the last.

The importance of giving more attention to the clearance of the tool is enhanced when we notice that diminished clearance not only sustains the edge from crumbling or wearing away under the cutting strain, but, the cutting angle remaining the same, it tends to prevent the edge from overheating and losing its temper by giving a greater bulk of metal to absorb and conduct the heat away from the edge. This ability to keep cool by its bulk gives the old diamond point a great advantage over a side tool, which is sometimes used and advocated for outside cutting.

But what I set out to do at the instigation of Mr. Bartlett was to speak of diminished clearance as a cure for chattering. I do not think I need to say a word about it. A look at these figures, the *A*, *B* and *C* of chattering will show all there is of it. In *A* we have a bad case of chatter, and a tool with more clearance than anything else, which is capable of reaching the lowest depths and of following every line of the undulations. If the work does not chatter it will be no thanks to the tool. Now, by simply reducing the clearance angle, *B*, we have a tool that cannot possibly follow every curve of the wave, but must ride smoothly upon their crests. The curious thing here is, that while *A* might possibly cut as smoothly as *B* does, *B* could not possibly cut as chatteringly as *A* does. *A* is too "smart," and the limit we put to the abilities of *B* is a positive and decided improvement. The clearance may be reduced either by changing the front of the tool, as we do at *B*, or by simply elevating it, as we do at *C*. In the latter case we, of course, get more cut proportionately as we reduce the clearance.

As the cutting points of our lathe tools are very generally used above the center—and I scarcely know why—the clearance angle of the tool relatively to the work is constantly changing, and requires constant readjustment, which, truth to say, it seldom gets. When it comes to diminished clearance as a cure for chattering, the adjustment must sometimes be very fine, which means emphatically an elevating tool-post. I am of the opinion that it should be an indictable offence for any one to manufacture, buy, sell, or have in his possession a lathe up to 24" swing without some device for elevating the tool-post. A lathe without elevating tool-post is of necessity a demoralizing influence. The tool cannot be adjusted correctly for clearance, so it does not matter how it is, and a general habit of carelessness is engendered. The tools about such lathes, as a consequence, are seldom found at their best. The latheman is in constant trouble, and has to squirm out of it as best he can. One of the devices for evading the consequences of improperly adjusted cutting tools is the spring tool. It is one of the evils that have to be tolerated. I took a walk around the shop the other day, and I found these spring tools upon the lathes without elevating tool-posts, and nowhere else.

The spring tool is what Mr. Bartlett is advocating for cutting threads. He calls it a camel back, and I am thankful for the name, and will hereafter employ it. The tool is essentially a creature of the desert and the barbarian, and not to be tolerated in regions of advanced or advancing civilization. How terrible to think of wandering a chattering wilderness forty years with it, and never to reach a land of rest, where tools cut smoothly.

The spring tool, whether for threads or for other purposes, is a move in the wrong direction. It does not belong to the race of cutting tools, but is simply a scraper. As a cure for rough or chattering cutting, it is a cowardly evasion of a difficulty. The worst trait a young mechanic can have is that of giving up under difficulties. He that fights and runs away, they say, will live to fight another day. It's a lie. He that fights and runs away will live to run away again next time, and every time. If he runs a lathe, you always find a spring tool upon his board. I have cut metal under a great variety of circumstances, and as successfully as most operatives, and I have never used a spring tool upon a lathe. When I have found a tool to cut unsatisfactorily, I have tried to make it better, and not to make it worse, and I have invariably found success in that direction. A spring tool, no one can pretend, is a better tool either for heavy cutting or for accurate cutting, and, being deficient in these respects, the simple ability to cut smoothly, which some enthusiasts claim for it, is not a sufficient compensation. In the case which Mr. Bartlett cites of tools which cut rough threads, I have found success by making the cutting angle sharper, by reducing the clearance as much as possible, by accurately adjusting the inclination sidewise, and by making the tool and holder more rigid, instead of more elastic.

Mr. Bartlett shows, what is undoubtedly true, that a tool ground accurately to the thread gauge can only cut a thread perfectly true to the gauge when its cutting face is radial and its front tangent to the work. Any variation from this must make the thread more or less obtuse. In practice, we may grind the tool a little more acute than the gauge, and pitch the cutting face backward, thus raising the point and improving the cut, and in this way produce a thread which is practically perfect. As a matter of fact, I am credibly informed that the Pratt & Whitney standard gauges are cut with tools having an angle of 75° instead of 90°, which theory demands. Messrs. Pratt & Whitney do not cut their best screws with "camel-back" tools.

It is rather singular that Mr. Bartlett should call our attention to one essential condition of perfect accuracy in screw-cutting, and then suggest a spring tool. A spring tool must be meant to spring, and if it springs how can its work be perfect?

Now, don't go and say that I said what I didn't say. Chattering is one of the worst annoyances that I have ever encountered. I have not found a cure-all for it. Attention to the clearance of our lathe tools is simply one thing that may help us. Rough cutting of threads I have cured as often by changing the oil used as in any way. Chattering I have found to arise from a variety of causes, so that a device which would cure it in one case would make it worse in another. Sometimes the chatter is caused by the vibration of the tool, and sometimes by vibration of the work. I have seen chatter caused by cuts too light as well as by cuts too heavy. In chuck work with a loose spindle a cut which just carries the weight of the work will surely chatter, and a cut either heavier or lighter will cut smoother.

I very often find myself advocating a spring tool—never a tool of such a shape or so placed that it can properly be called a "camel-back." A camel's hind leg would be a fairly descriptive name for it. I mean a spring tool so made as to compensate for the downward spring of the tool-holder of a planer. Of course, it is a cowardly way out of it, but no better way has been devised. Why doesn't some one improve the planer? The first one I ever took hold of had the same trick as the last one built. The tool will always spring down and gouge in under a cut. The evil is not serious except upon work where we have to reach down to some depth, and then the leverage of the tool increases the spring, and there is a snapping and anxious time. A straight tool cutting backward would work all right if a way were devised for clearing the tool upon the return stroke. If some one doesn't do something about it pretty soon, I shall be under the necessity of doing it myself.

The wire cable of the Brooklyn bridge, in nearly two years' use, has been stretched so as to lengthen it about one and one-half per cent. The cable shows but little signs of wear, and it is believed that it will last for two years more.

Friction Clutch Pulley.

The engraving represents a friction clutch pulley of simple design, and that at the same time performs its duty in a very satisfactory manner. The engraving represents all the parts of this pulley so clearly as to render its action perfectly apparent. In use it holds firmly, is very easily operated, and the parts are subject to but little wear.

The manufacturer is William H. Eddy, Worcester, Mass.

Oldman's Ways and Means—Honest and Dishonest Practice.

BY JAMES F. HOBART.

Oldman's shop is a study. It is full of curiosities. When Oldman was a boy, he built a screw cutting lathe. That lathe is doing duty to-day. Oldman's father was a mechanic and a mathematician. Machine tools were scarce in his day. When he wanted a tool, he built it. He made patterns for a lathe, got castings from them, and then finished up his lathe bed with chisel and file. Oldman's father never saw but one planer. Oldman bought a little planer in 1836. He hated to do it. "Didn't need the thing," he said, "for his father never had one." Oldman's brothers made him buy it. Their father said it would be a "good thing to have," so they bought it. The old slabbing machine was dispensed with, and the planer put in its place. They made an index plate and rigged up the slabbing machine for a gear cutter. It is in use to-day. Oldman's father died, and Oldman Brothers succeeded to the business. They built a big wooden boring machine. They made two or three new tools, but *never* discarded an old one. Oldman's younger brothers kicked once in a while. They wanted to buy some modern tools and get special machinery for some things they made. "No!" said Oldman, "we don't want such things, father never had them."

The river got low every Summer. "Let's get an engine," said the youngest brother. "No!" "We'll build one when we get time," said Oldman. He never did get time. He was always in a hurry. He never could get time to put in an elevator to carry castings up stairs, so two or three men would lug them up. He could not stop to put in an elevator. He was in such a hurry all the time that "if the shop got a-fire he could not stop to put it out."

Not a shaper in that shop. Not a milling machine or a turret lathe, or a power cross-feed on any of the lathes. They wanted a chucking lathe. They built one. They made water wheels and general mill work. When times were dull, they would all go a fishing, and let their men hoe corn and play book agent until times were better. Oldman made money. His expenses were small. His brothers made some money, too. They wanted to take a contract to make sewing machines, or some other tools, and fill the shop with men. But no; Oldman had rather keep on in the old ruts, and let well enough alone.

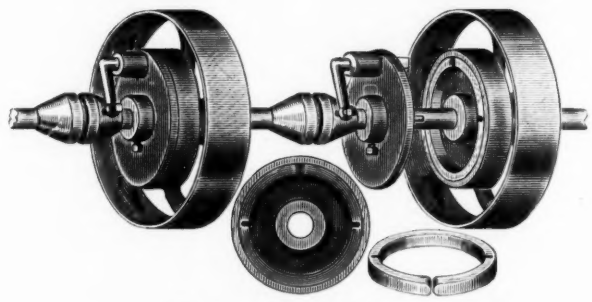
They had lots of small tools in their shop. They had a small 12″ drill lathe, and 200 or more drills from $\frac{1}{16}$″ to $\frac{7}{8}$″. They had 7 drill chucks for the 200 drills, and every one of those drills had its own pet way of being set in its own particular chuck. All the taps had certain holes in certain tap wrenches. They would go there, or go no where.

All the lathe tools in Oldman's shop were kept where they had happened to fall. Everybody used everything, and nobody cared for a tool after he was done with it.

One day Oldman up and died. His oldest brother went out of the firm, and Oldman Brothers ceased to exist. Oldman's youngest brother and the brother's son took the business. The old shop began to look like a new concern. An elevator was built; two or three of Oldman's pet antediluvian lathes were thrown out; a shaping machine was bought and set up; a set of twist drills appeared on the lathe stand, and six chucks and 180 drills were done away with; all the lathe tools were hunted up and overhauled. There were eight or nine good sets, besides any number of special tools.

They didn't go to work and start a tool-room. No, that would hardly pay as yet, but they did go to work and have some nice tool boxes made; gave one to each man with a set of common lathe tools therein, also with place for hammer, chisel, files, etc. The special tools didn't hang out on 15 lathe boards any longer. You didn't have to uncover a lathe every time you wanted to use the whole length of it. The steady rests were hunted up; they were dug out of piles of blocking, from under benches and lathe beds, and were set up, each on its own lathe at the extreme tail end thereof, and the clamp bolt screwed up with the fingers sufficient to hold it there.

The shop began to look different. The firm took a couple of contracts. They made one or two little machines for special work. They bought four others from a machine tool company, and will never build another. They found that it didn't pay; Oldman didn't care whether it paid or not. He built one or two tools because his father had done so. There are more men at work in that shop now than ever before. From the nature of most of the work, each man is obliged to do all kinds of work. Each man keeps his own tools in order. He forges them when they are made, and sharpens them when they need reforging. If in the course of a job a forging is needed, a man makes it himself.



FRICTION CLUTCH PULLEY.

The young men are finding that they have not carried the thing far enough. It don't pay them to have a man run to the blacksmith shop and get out a forging, then drive Sam away from the upright drill for "just a minute" while he drills a couple of holes. It don't pay them to have a man wait 10 minutes to get a chance at the bolt cutter, the shaper, or the emery wheel.

If they put at man a each machine, and make him alone run it, then they will get into another scrape. If Ike wants a little forging, he waits for the blacksmith to make it, then hangs around while Sam drills the holes, and Major runs it over the emery wheel for him. They figure it up, and find that more time is lost by the latter than by the former method, but the machines are in much better shape now than they were when everybody used them.

Oldman's old shop was a first-class place to pick up ideas in. Almost every job had to be rigged up for, and done mostly by brains. One day Oldman wanted a reamer hole in step for a ventilating fan. Said hole was to fit an odd sized arbor. It was just $1\frac{1}{2}$″ in diameter, and the fluted reamer measured $1\frac{7}{16}$″. The man was waiting for the box, and laughing to see Oldman get stuck. He didn't laugh long. Oldman cut off a strip of tin 1″ wide and 6″ long, bent $\frac{1}{8}$″ of one edge to a right angle, and slipped it in the hole with the reamer and reamed the hole almost to size in "less than no time." It was not quite large enough, so Oldman cut another strip $1\frac{3}{8}$″ wide, and put that through. It did the business, and the $1\frac{1}{2}$″ hole was finished while the waiting man was wondering how Oldman would get out of the scrape.

It is a pity that some of the old chap's ideas can't be left in the shop along with the rubbish that their father used. We would sort them out with care when we threw away the old sculch. The young chaps are right on hand with new ideas, tools and machinery, and if they will only be as smart in "finding a way to do it," then they are the chaps to build up the machine business and make money.

The other day I saw a chap drilling an $1\frac{1}{2}$″ hole. The feed was rigged at 64 to the inch. Now that drill cut at each revolution, $1.5 \times 1.5 \times .7854 = 1.76715$ square inches, or just about $1\frac{3}{4}$″ per revolution. It turned around 768 times (12×64) in drilling a 12″ hole, therefore each lip of that drill cut over 1357.16 square inches of surface while going through the work, and as each lip cut about 11 cubic inches, it stands to reason that it took 123+ square inches of surface cut to get out one cubic inch of iron.

I saw a chap turning a $\frac{3}{4}$″ cut-off, a 16.5″ chunk of iron, leaving it 15″ in diameter. Now, that chap was taking a feed of $\frac{1}{8}$″. He cut off a chip $\frac{3}{4}$″ × $\frac{1}{8}$″ and went over a surface of 37.11015 square inches at each revolution. Now, $37.11015 \times .75 \times .125 = 3.479+$ cubic inches of iron cut off at each revolution, or for each 37.11015 square inches of surface the tool traveled over; or 10.66 square inches of cut for each cubic inch of iron removed. If we give $\frac{1}{16}$″ feed as when the calculation given May 23 was made, the tool will cut over 42.64 square inches, or about 40 as stated.

Once in a while a chap will yet get to thinking of something besides his work and set a tool too deep, cut his work too small, and get into an awful scrape. Sometimes a poor chap that is really a good workman will make a little slip like this that will require all his brains and two hours' time to get out of. Here is Sam. He is cutting a thread on the end of a 4-foot piece of 6-inch pipe. He has skimmed over it with a diamond-point tool; got it just the right size, and has cut the thread. Just as he ran over it the last time he got to thinking of a job which was coming in after dinner. He set up the thread tool too much and got the thread too small.

Here was a scrape. Just 10 minutes of 12 o'clock and there is the team driving up after this piece of pipe. It is loose in the flange which is to go on it. What shall he do? Have a piece cut off the pipe, a coupling and a short piece put on, is one way; to get a new piece of pipe is another right way out of the scrape, but either way Sam is in for "a blowing up" from boss. I can "cobble it up," thought Sam, "and nobody will ever know it."

He dives under the bench and brings out a piece of fine brass wire cloth. He cuts off a piece 4″ x 6″, daubs it with red lead, lays it into the flange and screws in the pipe. Then he trims off all the visible wire, and the job is ready just as the team backs up at 12 M.

There are lots of chaps like Sam. Some of them are machinists, some are boiler-makers and some are bosses and contractors, but none are *honest* men. Perhaps a Sam plays one of these tricks on a steam boiler, and the public wonder why that boiler "let go" with two gauges of water and 60+ lbs. of steam.

Sam may build engines, and we wonder why that engine does not do better until the indicator gives Sam away. Contractor Sam may be doing a rushing business making mud tenement houses or building tea-kettle war ships; no matter what, if he is like our Sam he will cheat somewhere to cover his own mistakes or to do work easier.

Many a boy has been driven to be a Sam, just because boss made such a fuss over a little job that got spoiled. The next time Sam covered it up with red lead and wire gauze; by-and-bye he got lazy and covered up another job rather than trouble himself to do it right.

"Try not to do it next time, Sam," from the boss, might have made a different man. It might have prevented a big breakdown in Blank's engine-room, or that boiler explosion that killed and wounded thirteen men in that saw-mill.

Stick up for honest work, and if anybody wants you to do a wire cloth job just tell him "no," and then stick to it. You will never suffer thereby.

Discussion at the Mechanical Engineers' Meeting.

In the discussion on William H. Weightman's paper, on "The Oxidation of Metals and the Bower-Barff Process," read at Atlantic City, Mr. Towne said that one year's experience with the Bower-Barff process, showed that where articles so treated had not been exposed to weather they had stood well, but boat trimmings and articles exposed to moisture for one season or more do not stand, the metal oxidizing worse than when not coated.

Howell Green said he would not attempt to discuss chemically, either the Bower-Barff or the Buffington process described by Mr. Weightman. As he understood it, the former process undertakes to put pieces of iron in a muffle, heating it and subjecting it to the action of superheated steam, covering the iron with magnetic oxide of iron to protect from further oxidation.

Having lived long in the anthracite coal regions, he had experienced his share of trouble owing to the oxidation of metals caused by the presence of iron pyrites which mixes with the water of the mine, sets free a sulphuric acid, and coming in contact with the metal used in the pumps, destroys the iron parts.

A section of 12″ column pipe was shown, being cast-iron pipe and hard iron, half No. 2 hard foundry, and half scrap. Originally one inch thick, the pipe was eaten down to $\frac{1}{8}$″ to $\frac{1}{4}$″ thick. Just when the pumps are most needed, they corrode and become useless.

Mr. Green estimates that in the "Mammoth Vein," which furnishes about one-third of the total output of anthracite, say about ten million tons out of thirty million, this pyrites difficulty, adds two cents per ton yearly to the cost of mining, the total additional expense so caused in the big vein amounting, therefore, to about $200,000 yearly.

Mr. Green does not propose to fight nature, but will try to flank her if he can. His method of remedying this trouble proposes to take a pipe 9 feet long, 8 to 24 inches diameter, heat it to, say 600°, and insert in a bath of asphaltum and coal tar, hot. But here another trouble comes in. In time exfoliation of the tar takes place, and it comes off in flakes. He therefore proposes to protect the tar by wedging a wooden lining inside the pipe, made of dry pine, in staves, say $1\frac{3}{4}$″ wide and $\frac{5}{8}$″ thick.

Referring to the same difficulty, E. F. C. Davis said he had been making experiments to get an enameled coating inside pipes and pump castings generally, covering the core with an enamel made of silica, carbonate of lime, and sometimes a little boracic acid, of varying proportions. This coating is about $\frac{1}{16}$″ thick. Had been experimenting with it for two years with promising results, but could not yet say how long it would stand. Wished to know the experience of others.

Speaking of the process described by Mr. Weightman, Mr. Woodbury stated that the difficulties caused by the evolution of oxygen when the nitre was first heated, could be abated by the admixture with the nitre of a small quantity of black oxide of manganese; as when nitre is heated oxygen gas passes off very rapidly, but when black oxide of manganese is mixed with the nitre, the production of the gas is regulated, but the manganese does not undergo any chemical change. It is quite possible that this use of manganese would interfere with the char-

acter of the uniform finish of the oxide formed on the metal under the process.

The paper of Erwin W. Thompson, explaining the manufacture of cotton seed oil, was favorably reviewed by the members present, the President remarking that the machinery appeared to be similar to that employed in the manufacture of linseed oil, except that for crushing the seed, and asking if Mr. Thompson was aware of any process in which presses are dispensed with and chemical means substituted.

Mr. Thompson said naphtha had been used for bleaching after crushing, but the experiment was not commercially successful, as the odor so caused could not be gotten rid of, and fire risks were greatly increased, insurance rates being already 5 or 6 per cent.

Mr. Kent said the low value of cotton seed hulls as a fuel, was due to the kind of furnace used, and suggested that there be a combustion chamber arranged to burn the gas generated.

Mr. Thompson thought this suggestion would be adopted.

Exports and Imports for 1884.

According to the recently issued annual report of the American Iron and Steel Association, only 4,182 net tons of iron ore were exported from the United States in 1884, valued at $12,255. The exports of iron and steel consisted of machinery valued at $4,131,810; sewing machines, $3,264,935; 189 locomotives, $2,057,271; firearms, $1,427,600; saws and tools, $1,234,473; stationary engines and boilers, $456,930; scales and balances, $397,563; miscellaneous castings, $293,494; 3,948 tons of cut nails, $247,497; stoves, $198,883; printing presses, $196,953; 5,504 tons of steel rails, $176,891; 11,889 car wheels, $109,255; cutlery, $94,671; 4,301 tons of pig iron, $92,336; 932 tons of bar iron, $52,872; 1,254 tons of iron rails, $46,644; 517 tons of plate, sheet, and hoop iron, $45,907; fire engines, $28,273; 129 tons of steel ingots, bars, etc., $21,799; other manufactures of iron and steel, $4,714,838; total value, including iron ore, $19,303,150. Comparing the iron and steel imports and exports in 1884, we find that 1,254 net tons of iron rails were exported against only 94 tons imported; 5,504 tons of steel rails were exported against 3,074 tons imported; and 2,509 tons of wire were exported against 2,732 tons imported. The total value of iron and steel imports in 1884 is almost exactly double the total value of iron and steel exports. If the value of the imports of tinplates and wire rods, amounting to $21,414,349, be deducted from the total value of the iron and steel imports, $38,211,800, the remainder, $16,797,451, will be considerably below the value of our iron and steel exports, $19,303.50.

The *New Orleans Picayune* in concluding an editorial on the close of the World's Exposition, says:

"That it was a financial failure goes without saying, but it did not destroy its merits as an exposition; but that it was such a failure must ever be a matter for regret to the people of New Orleans. Unfortunately for its success, it was too far from the great centers of population and the thickly settled regions of the Union to give it the constant attendance of the large number of people necessary to contribute a fund for its support.

"Without going into details, the exposition has cost from a stock standpoint something like $2,500,000 more than it was able to earn, and to have made up this large sum would have required the attendance each day for the 180 days of the six months of the exposition, of about 28,000 people, each one contributing a fee of 50 cents at the gate, or paying in a daily aggregate of $14,000. There were so very few days during the continuance of the exposition when there was any such attendance that any prospect of raising so large an amount of money from gate fees must seem entirely hopeless."

The new Brazilian iron-clad, Aquidabau, is 280 feet long and 52 feet wide. She steamed 15¼ knots per hour at 5,270 indicated horse-power.

16-In. × 6-Ft. Plain Turret Lathe.

This lathe, made by Lodge, Barker & Co., Cincinnati, Ohio, is intended for rapid work in brass finishing establishments.

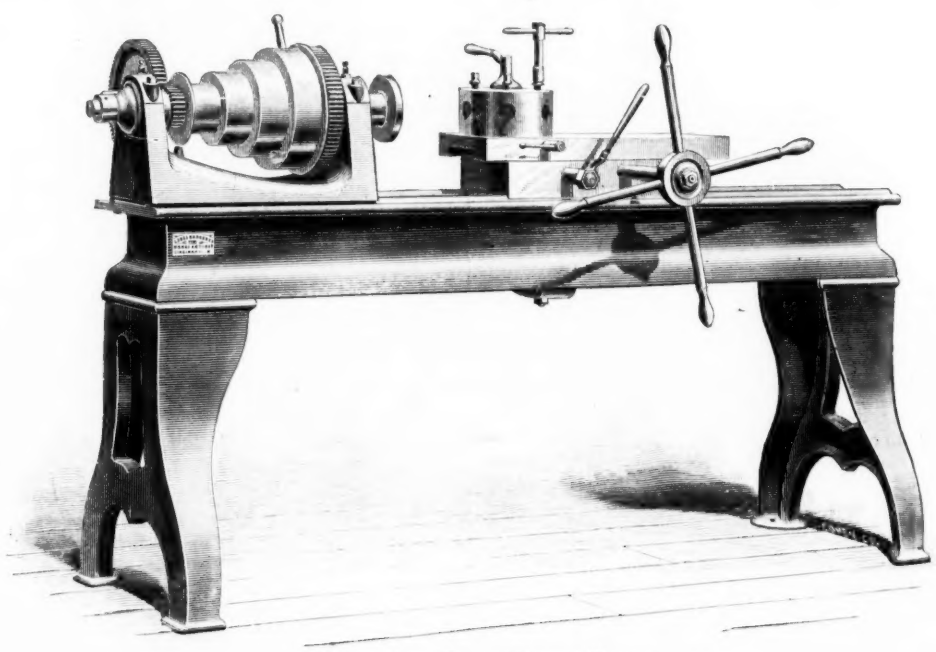
The turret is 8″ diameter, and has six holes.

The top slide will travel 20″ when the turret does not revolve automatically, and pilot wheel is used.

When desired, a lever is substituted for the pilot wheel, in which case the stroke is 7″.

Everything represented in engraving is furnished with the lathe, also countershaft with forward and back motion.

Weight of machine, 1,200 pounds.



16-IN. X 6-FT. PLAIN TURRET LATHE.

We learn that Thos. Pray, Jr., has resigned his position as general manager and managing editor of the *Manufacturers' Gazette*. Mr. Pray has greatly improved that paper, and given it a prominence it never reached before his connection with it.

LETTERS FROM PRACTICAL MEN.

Notes on Lathe Running.

Editor American Machinist:

I run a 19″ Putnam lathe in a small shop. Its principal work is making small bolts, studs, and other kinds of screw-cutting work. A little while ago my friction clutch pulleys were worn very loose, and worked badly. I bushed them, and put in self-oilers, of a kind I have never seen before. They are ½″ nipples, tapped into the loose pulley hubs and partly filled with waste. Plugged couplings are screwed on the outer ends of the nipples. The nipples, about 4″ long, will run the pulleys with one filling about two weeks. Without them the pulleys must be oiled every two days.

I keep in a cigar box, on my bench, a lot of nuts. They are of various sizes, and tapped with the shop taps, and marked each one with size and pitch of thread. They save a good deal of time on some small work. Suppose a bolt is to be made to fit our ½″ 12-thread tap: One way would be to go (40 feet) to the cupboards, get the ½″ tap and wrench, walk fifty feet after a half-inch nut, seventy-five feet after an oil can with no oil in it, and, after a while, get a nut tapped out; then fit the bolt to it, and lay them both on the bench. Nobody would ever know that for a half-inch nut again. Time occupied in getting that bolt threaded to the right size, 20 minutes. Go through that same process every time you make a bolt.

My way is to finish it all but the thread, then reach around to that cigar box and get the nut marked ½″—12, and fit the bolt to it. Time occupied (in sizing thread) 2 minutes, at a liberal estimate.

I often have orders to fit a bolt or piece to a hole to be made by a certain size of twist drill. I have to make the hole first. I reach over to that cigar box and get a piece of ½″ by 2″ bar iron, about 5″ long, having several holes of different sizes drilled in it. Each hole has its size marked close by it. I take that piece over to the drill press, hunt up a half-inch twist drill (we've got one, if it isn't broken or lost), and commence drilling holes in a piece of scrap iron which I find somewhere on the floor. The first hole I get considerably larger than the drill, which has been ground successively by the boiler-maker, the blacksmith and the cupola-tender. I grind it two or three times, and after a while get a hole nearly the size of the drill. Then I take up that piece of bar iron and drill a hole through it and mark the size near it. The next time I want that size I find it in the cigar box.

S. A. W.

Leadville, Col.

Examples of Steam Heating.

Editor American Machinist:

In Questions and Answers (178), June 6th, 1885, "Radiate," Boston, asks about radiation and steam heating. Perhaps I can help him to an answer.

The formula you quote from Briggs reduced to Radiate's query, becomes $\frac{3\times60}{100}$ = 1.8 heat units radiated per square foot, radiating surface per hour per degree Fahr., difference of temperature between steam and air.

In "Steam Making," by the late Prof. Charles H. Smith, the formula given is 2.6 heat units per square foot per hour per degree difference.

I quote you the following statement of a practical case:

Washington University owns a group of buildings devoted to various uses, such as halls, library, gymnasium, school-rooms and shops. The buildings are of various ages, all of brick or stone, and of good average character. They are scattered on three city blocks.

Steam is supplied from a central station by mains underground. It supplies all heat, runs an elevator and small engine in physical laboratory. Steam from shop engine (50 I. horse-power) is utilized for heating. The heating is about equally divided between direct radiators in the rooms and indirect heaters sending warm air through pipes from basements to the rooms. The figures given a are close approximation in round numbers from records of five winter months—November, December, January, February, March, 1883-4.

Space heated, cubic feet	2,250,000.
Radiating surface, square feet	16,000.
Space per square foot radiating surface (nearly)	140.
Average time when steam is turned on daily (hours)	10.3
Average steam pressure, busy hours	40.
Average steam pressure day and night (say)	15.
Number of days recorded	151.
" " busy hours	1556.
" " hours, day and night	3624.
Coal burned, net lbs. (Southern Ill. coal)	2,195,200.
Coal burned per hour, day and night (lbs.)	606.
Coal burned per hour, busy hours (say)	1300.
Water evaporated per lb. coal (actual condition)	6.
Water evaporated per hour, busy hours (lbs.)	7800
Water evaporated per hour, day and night (lbs.)	3636.
Heat units radiated per lb. of water (about)	1000.
Temperature of steam, busy hours, deg. Fahr.	287°
Temperature of air in rooms, busy hours	70°
Temperature of steam, day and night	250°
Temperature of air, day and night	55°
Mean temperature of external air for five months	36.4°
Heat units radiated per hour, per square foot radiating surface, per deg. difference of temperature, busy hours	2 23
Heat units radiated, etc., etc., day and night	1.42
Mean of the two constants.	1.85

I give two values all through, because nearly all the work is done in the busy hours. During the rest of the twenty-four, the work is very light. These figures are not exact, of course, but are fairly representative of the actual performance of the system.

Perhaps this will be a good time to give a few facts about heating by exhaust steam. I speak of it, because I have met with not a few practical (?) engineers who deny its feasibility.

One of our buildings contains 450,000 cubic feet of space equally divided between school-rooms and shops. We heat this by both coils and indirect heaters with the exhaust of a 50 I. H. P. Corliss engine (14x42), until the external temperature falls below +10° Fahr., when we put live steam into one half, and trap the returns into the regular returns from the exhaust side to the boiler house hot-well. We do not have over three pounds back pressure in so doing. But our pipes are large, direct and free from traps in the run.

Other buildings, heated by live steam, return direct to the boiler without traps.

C. F. WHITE,
Manual Training School.

St. Louis, Mo.

Forming a Draftsman's Society.

Editor American Machinist:

I have read the proposal of Mr. Pierce Butler to form a national association of draftsmen with great pleasure, and the prompt responses from several of the brethren proves the suggestion a live one.

As far as I know, Mr. Butler is perfectly right in his assertion, that there is no society of this kind. The one mentioned by Mr. Alexander in your issue of May 30, will as little answer the purpose as the A. S. M. E. The proposed society will have comparatively little to do with scientific and practical engineering questions. It is the management of the drafting departments which will be the basis for papers and discussions, and I know the field to be a wide one.

There are few drafting departments where a "perfect" system for making and classifying drawings is carried out, although I think every one of us can see the benefit derived from it. To make a drawing which conveys to the mechanic a perfect understanding of the work he is to execute, without compelling him to waste his time finding out what this and that means, is not as easy a matter as many say and think. Hundreds of drawings are made every day which will prove this. Here is work for the association.

It is, however, not the drawings alone that

stamp the drafting department; another point of great importance is the classification, etc., of drawings in such a way so as to enable one in the shortest time to procure drawings, specifications, etc., necessary for reference in laying out new work, or duplicating details or complete machinery built years ago.

Then we have improvements in duplicating drawings, which I am sure will give the association a good deal of work.

The connection between the drafting departments and the different shops is another question of great importance which no doubt will procure both papers and lively discussions that will be of great benefit to us all.

I mention these few facts as a pointer to the advantages of such an organization, and feel confident that Mr. Butler's suggestion will meet a hearty response from every draftsman that feels pride and interest in his profession. There are firms, no doubt, who will look unfavorably on the proposition on account of the loss of time; but I am satisfied the time will come when the benefit derived from this source in the management of their drafting departments will induce them to even, as Mr. Butler says, "foot the bill."

OLAF GULDLIN.

Kerr-Murray Manufacturing Company, Fort Wayne, Ind.

Forming a Draftsman's Association.

Editor American Machinist:

As one of the fraternity of draftsmen, I most heartily indorse the movement to form a national society. As Mr. Campbell aptly remarks in his recent article, it is difficult to locate the dividing line between what are known as draftsmen and the higher grades of the profession, known as designers and mechanical engineers. Draftsmen at present occupy a somewhat anomalous position in the mechanical world. They seem to furnish the "missing link" between the brain of the theorist and the hand of the workman, and are recognized as neither. The only resort for this "peculiar people," therefore, is to form a guild or association of and for themselves. While, for various reasons, many of them are debarred from the benefits of the A. S. M. E., they are still in possession of a practical, every-day kind of knowledge, the mutual exchange of which could not but be beneficial, both to themselves and the mechanical world at large.

It is safe to predict that the reports of their meetings would furnish interesting and instructive reading, and would be so far devoid of abstruse theories and dry statements as to be welcomed and understood by the proverbially intelligent American mechanic.

NEMO.

Casting Rolls on Wrought Iron Shafts.

Editor American Machinist:

As there is much interest shown in the matter of casting rolls having a wrought iron center, perhaps another suggestion will not be out of place.

I know of one instance where it was required to cast upon wrought bars having a rectangular section, and it was found that the iron did not close up well over the corners. Subsequently the corners were made round, and the difficulty disappeared. The bars were tinned in each case.

I do not believe the surface of the wrought iron is melted, unless a quantity of very hot iron is run through the mould. I have seen such castings broken up, and, while the cast and wrought iron seemed to be as one piece, still the separation would be where the cast and wrought iron joined, and it was clear that they were not welded. The union was so close, however, that I think no amount of strain short of breaking would have caused the bars to become loose.

Large castings have been made having a small tube running through them to serve as an oil-hole, where it would be impossible to drill. If a $\frac{1}{4}''$ or $\frac{3}{8}''$ tube is not melted in a heavy casting, it seems reasonable to suppose that the uneven surface of a shaft or bar would not be under similar circumstances.

Since it has been demonstrated repeatedly that a roll can be successfully cast upon a wrought iron shaft having a smooth surface covered with tin, why be to the expense of cutting threads, grooves, or drilling holes?

To make the rolls in question successfully, it is only necessary the shaft should be *clean*, and completely covered where the cast-iron comes in contact with a *light* coat of tin.

WILLIAM G. RICHARDS.

Oiling Locomotive Valve Motion.

Editor American Machinist:

Brother Phelan's criticism of my suggestion to put oil holes on the inside of links for eccentric blade pins instead of the outside is duly noted; and in reply would say that I fear that Bro. P., like myself, has judged this suggestion from his present surrounding circumstances. I will venture to say that he is employed on a standard gauge road in the Northwest, where there is snow for six months in the year, and regular showers the other six, on an eight or ten-wheeled engine, having at least five-foot wheels, eccentric blades from four to six feet in length, whose motion on the pin in link is not over $\frac{3}{8}$ to $\frac{1}{4}$ inch, link block at least three feet from ground, and lower end of link, when in full forward gear, at the least two feet from the rails; there the brass cups and wool are all right. But here in the Southwest, where we run over alkali deserts and up mountain steeps, where it has not rained, all told, one hour for ten years, where sand drifts like snow (often blowing so hard that it is impossible to keep head out of cab window for one minute), on an 18×22, 35-ton, consolidated engine, of only three-foot gauge, 36-inch wheel, the length of eccentric blade from center of link block to center of main axle only twenty-seven inches, thirteen-inch eccentrics, with five-inch throw of valves, only sixteen inches between front and main drivers, and this space completely filled up by a driving brake, *behind* which the links are situated, he would see the difference. Our broad-gauge engines in this part of the country are little better, except in width, the standard engines being consolidated, 36 to 40-inch wheel.

Bro. P. would see that the forked end of the blade or hook, with these short blades and link radius, will not admit of any cup over $\frac{1}{4}$ of an inch high. He will see that the lower end of link, when in full forward motion (and we always run down these mountain grades so, of course), is not over eight or ten inches above the ground, and cinders and ashes from our necessarily low ash-pans are stirred up by the links, which actually touch and scrape through the piles of ashes left at water tanks or stations where fires are cleaned.

I did not hope or infer that *all* the oil that worked by the link block would be conducted to the lower pin by the V ways, but only a part. As to having valves faced, I am personally acquainted with several companies who do not or will not do work of this kind until it is impossible for the engine to do her work at all. Bro. P., I hope, has never run where the average life of an engine from the general overhauling shops is eight to twelve months, and fifteen months an extraordinary long run. I have taken engines to the shops on which you could move the valve stems $\frac{3}{4}$ of an inch with the hand from lost motion in the link gear, the result of our dust storms, and they had not run over one year, either. Inside oil holes *might* not be a big improvement on some engines, and cups would be better; but I believe they provide the best way out of *our* trouble, and the foreman of the back shops here has told me that he should give my plan a trial at the first opportunity, and if the recording angel has any more "cuss words" to enter than he has now, he will have to hire more clerks.

J. A. HILL,
So. Pueblo, Col. Locomotive Eng'r.

Formula for Bursting Stress of Boiler Shells.

Editor American Machinist:

Mr. W. E. Crane writes in your issue of June 13 that the generally accepted formula for the bursting stress of the shell of a steam boiler is

$$\frac{\text{Tensile strength} \times \text{thickness}}{\text{radius.}}$$

I presume this is generally accepted, but it is not exactly correct. The longitudinal stress is one-half as great as the diametrical; hence the resultant, or actual stress, is represented in direction and amount by the diagonal of a right-angle triangle, whose base is one (1) and the vertical one-half ($\frac{1}{2}$), and consequent hypothenuse, or diagonal, nearly one and twelve hundredths (1.118).

It will then be seen that the ordinary formula gives the strength of a cylinder about 11 per cent. too great. A. F. NAGLE.

Chicago, Ill.

Williams' Automatic Cut-off Engine.

The accompanying engraving illustrates an automatic engine lately brought out by Sam'l T. Williams, of Baltimore, Md. It appears to be well proportioned in its parts, with ample metal in the frame to resist vibration and strains. A heavy rib runs the entire length of the frame on the inside, to insure stiffness. The main shaft bearings are in length equal to the diameter of the cylinder, and in diameter about half that of the cylinder.

The governor is of the centrifugal type. It consists of a peculiar-shaped cam working inside of the eccentric, and held in position by the ordinary balls and springs. The construction of the cam is such that there are always three points, nearly equidistant from each other, in the inside of the eccentric, in contact with the cam and shaft. The eccentric will vary the point of cut-off from 0 to $\frac{3}{4}$ of stroke, a slight movement of the cam shifting the eccentric a considerable distance.

The valve is a flat plate working between two flat parallel surfaces, one of which is an adjustable plate, which sets in inclined ways in the steam-chest bonnet. The plate is held

down to the valve by a set screw. The steam passes in through the central part of the valve, and its pressure tends to force the plate from the valve, but the screw keeps it in place. When wear occurs, the plate can be set up to the valve by the set screws. Only exhaust steam goes into the chest around the valve. Live steam goes direct from the port to the cylinder. No packing is required around the steam-chest bonnet, and only enough around the valve stem to prevent water from dripping out. Although a perfectly balanced valve is used, the governor, it is said, is in other instances used to drive an unbalanced valve.

The piston body is solid, with a wide groove around it. The packing rings are segments of two thick rings, with plates on the inside to break joints. Into the ends of these segments, spiral German silver springs are inserted, which keep it in steam-tight contact with the cylinder, but permits it to work with but little friction.

Steel is used wherever practicable, and all pins, nuts, and bolts are made to gauge and case-hardened. All bearing surfaces are scraped to a fit, and all joints ground steam-tight. The parts seem to have ample strength and to be carefully constructed. The same arrangement of valve gear is equally applicable to horizontal engines, upon which it has been applied with good results.

John William Nystrom, C. E.

The engineering world lost another of its notable men in the person of John William Nystrom, who died in Philadelphia, May 9th, in the sixty-first year of his age.

Mr. Nystrom was born at Atvidaberg, Sweden, in 1824, and came to this country in 1847. He was educated at the Royal Technological Institute at Stockholm. In September, 1846, he was (while yet a pupil) appointed sub-foreman of the machine works, by reason of his "acknowledged insight in the elements of mathematics, physics, and technical mechanics; also superior skill in machine drawing and machine works," coupled with "the confidence he acquired through his regularity and reliability." In November of the same year he went into the model foundry and machinery department of the Moltka Manufacturing Works as a pupil, and upon his departure for America in May, 1847, he carried a strong letter of commendation from the head of that establishment.

The Iron Office of Sweden is an institution extending by branches all over that country, with its administration located at Stockholm. This Iron Office has the privilege of keeping constantly four Alumni at the Moltka Ironworks, which Alumni are selected from various technological institutions, and Mr. Nystrom was one so selected from the Royal Technological Institute.

On his arrival in this country he was employed by Captain R. F. Loper, of Philadelphia, as draftsman, and designed for him a large number of propellers, which were built by Neafie & Levy. In 1848 Mr. Nystrom invented a calculating machine, for which he received a first premium at the Franklin Exhibition in 1849. By the aid of this machine calculations can be made in a few hours, which would occupy weeks to accomplish in the ordinary method. For surveyors it is invaluable, as the trigonometrical formula can be computed without any reference to tables of the trigonometrical lines, or logarithms, including navigation, as he also adapted it for navigators. By it they could in an instant calculate their position at sea, latitude, longitude, courses, etc., without previous knowledge of the complicated study of navigation.

Mr. Nystrom was superintending engineer at the works of General Maltzof, in Russia, from 1857 to 1860. In a letter dated St. Petersburg, Jan. 26, 1872, the General said to him:

"Myself and all my people will never forget you and your services in promoting the engineering business of my place, and I believe that it is in some way your energy that gave the good impulse to my works, and which gave the possibility to accomplish the last difficult enterprise with locomotive works."

The Institution of Civil Engineers of London, appreciating the labors of Mr. Nystrom, gave him a standing invitation to exchange with them "ideas exhibiting careful thought and study on any engineering topics."

In the year 1873 Mr. Nystrom investigated the question of supplying the city of Philadelphia with water, and in 1878, he was engaged by Mr. James Haworth to report on the Philadelphia water supply, the writer of this assisting him. They reported that, with the aid of proper impounding dams and certain alterations of the pumps and turbines the entire supply of water for Philadelphia could be furnished for nearly a century to come by the water power of the Schuylkill river below Roxborough pool.

Mr. Nystrom was a ready writer, and his contributions to the scientific literature of this country extended over a period of twenty-five years. He was the author of a "Pocket Book on Mechanics." His last work, just prior to his death, was a complete revision of it for the eighteenth edition, which is greatly enlarged with new matter. He also wrote "Steam Engineering and Force of Falling Bodies," "Technical Education," "Metric System and Dynamics of Steam Boilers," and "A New Treatise on Elements of Mechanics."

This last-named work, dealing as it does

mainly with the strict technicalities of so exact a science as dynamics, and not pretending to furnish popular information, contains matter which cannot fail to interest even the most non-scientific reader, while it must be prized highly by those versed in technical mechanics. The author starts out with the claim of entering on an unfrequent path, and of attempting to clear up, to a great extent, the inexactness heretofore existing in regard to the meaning of dynamical terms. This he succeeds in doing so well that his treatise is an important contribution to scientific literature, especially valuable to students of mechanics, for whose use it is especially intended. The technical terms he adopted are those employed in the machine shop, rejecting what he calls "the ideal vocabulary heretofore used in text-books and colleges." There is no doubt that this confusion of terms has been a great drawback to the progress of students and the labors of investigators, and it certainly could do no harm, and might be productive of most desirable practical results, if institutions of learning would give Mr. Nystrom's effort to establish a standard language in mechanics a fair examination.

From dealing with the hardest of earthly facts, the author proceeds to take a flight in the realms of speculation concerning the creation of worlds and planetary systems, and the inhabitable and civilized conditions of other worlds. This theme he treated in very readable style, and his remarks will be found curious and entertaining, if they are not entirely convincing. He did not profess a very high opinion of the civilization of our own much-abused planet, and concluded that we have reason sufficient to convince us "that there exist in other worlds beings far superior to ourselves, while above all presides the Creator of the universe, who superintends these myriad organizations, whose infinite inventions testify to His exhaustless and eternal power."

This work is one that will have a prominent place among the scientific publications of the day, and will add to Mr. Nystrom's reputation as an investigator and author in this department of scientific research.

Mr. Nystrom was very highly esteemed among his professional brethren as a man of sound reasoning, great ability and unbounded energy, and his warm sympathies endeared him to a very large circle of friends, by whom his death will be long and deeply regretted.

Mr. Nystrom was unmarried. His mother and a married sister survive him, residents of Atvidaberg, Sweden.

WM. BARNET LE VAN.

Examination for Stationary Engineers.

The following letter will explain itself. We can only say in reference to it that the list which we published, and to which Mr. Baldwin alludes, was furnished by one of the engineers, and was not a printed but a written list. We are pleased through the courtesy of Mr. Baldwin to be able to give the list complete:

Editor American Machinist:

In your issue of April 25th there appeared a list of questions used in the examination of engineers for a down-town building.

As there was but one competitive examination of this kind in New York, and as I was associated with it as examiner and formulated the questions, and as the order and wording of many of the questions in your list are mine, I assume you allude to the examination which took place at the Manhattan & Merchants' Bank Building. But as there appeared many interpolations as well as omissions from the printed list furnished the applicants, I trust you will, in an early number, give the inclosed list in full, that any misapprehension in the matter may be removed.

WM. J. BALDWIN.

QUESTIONS FOR ENGINEERSHIP COMPETITORS TO ANSWER.

1. How old are you?
2. How many years have you been an engineer?
3. Name the principal places or shops you have been an engineer in, and how long.
4. Have you a marine certificate as engineer?
5. State the "grade."
6. Have you a certificate from the New York Police Department?
7. State the "grade."
8. Are you a machinist, or have you any other of the mechanical trades?
9. State what it is and where learned.
10. Are you a graduate of any technical school?
11. If so, state the name of the school.
12. What is steam?
13. What is the temperature of steam at atmospheric pressure near the sea level?
14. What is the temperature of steam at 60 pounds pressure near the sea level?
15. What is the volume of steam compared to the volume of water from which it was made when the pressure is one pound above atmosphere?
16. What is the volume when it is 60 pounds above atmosphere?
17. What is meant by "dry steam"?
18. What is meant by "superheated steam"?
19. What is meant by "wet steam"?
20. What is meant by the heat or temperature of steam, sometimes called "sensible heat of steam"?
21. What is meant by the "latent heat of steam"?
22. What is meant by the "total heat of steam"?
23. In the conversion of one pound of water at a temperature of 40 Fahr. to steam at atmospheric pressure, how much heat is made latent? Answer in "heat units."
24. What is the (British) "unit of heat"?
25. What is "the mechanical equivalent of heat"?
26. Give the approximate horse-power of an engine whose cylinder is 12 inches in diameter by 24 inches length of stroke, making 150 revolutions per minute, the mean steam-pressure in the cylinder being 50 pounds. (Make no allowance for friction.)
27. Mention the names of the different classes of slide-valves you can remember.
28. Mention other valves you are acquainted with or have had charge of.
29. On the ordinary "D" slide-valve, what is meant by "lap"?
30. What is meant by the "point of cut-off"?
31. If a non-condensing engine cuts off at half stroke, the initial pressure being 50 pounds above atmosphere, what will be the *mean pressure* in the cylinder?
32. If the initial pressure is 90 pounds, cutting off at one-quarter stroke, what will be the mean pressure in the cylinder?
33. With 60 pounds of steam above atmosphere, what is the proper point of cut-off to have the terminal pressure at atmosphere?
34. Can you use the indicator? State where you did use it, and what make of instrument it was.
35. If the steam corner in the diagram is rounded, what does it indicate?
36. Can you compute the power of a diagram? If so, make a simple diagram, using your own initial pressure and point of cut-off, and give computed value.
37. About how much water (in pounds) per hour is used in the boilers of common engines per horse-power?
38. How many pounds of water (about) should one pound of anthracite coal evaporate in an ordinary horizontal tubular boiler?
39. How many pounds of coal per indicated horse-power should a good type of non-condensing engine be expected to use? Give weight for poor practice. Give weight for average good practice.
40. About how many cubic feet of air must pass through the grate to burn one pound of hard coal?
41. What is the greatest percentage of gain due to a feed-water heater (using exhaust steam to warm the water); in other words, what percentage (about) of the coal-heap will be saved by putting water into the boiler at 200 degrees instead of 40 degrees Fahr.
42. Where should the feed-pipe enter a boiler, in your estimation?
43. How should the bottom blow-off pipe be taken from a boiler, and from what part of the boiler?
44. Which is the safest, a *valve* or *cock*, in the blow-off pipe?
45. Give some rule for estimating the diameter of the disk of a safety-valve for a boiler of 100 nominal horse-power.
46. How many square inches are there in a disk four inches in diameter?
47. What will be the weight in pounds for a ball for a 4-inch safety-valve, the distance from the fulcrum to the center of the disk being four inches, and the weight of the lever 12½ pounds, and its center of gravity 20″, the weight being placed 20″ from the center of the disk, and the pressure of the steam 50 lbs. Also the disk unconsidered?
48. Under the same conditions, how far from the center of the disk should a 50-lb. ball be placed?
49. Make a diagram of some make of steam-gauge you are acquainted with, and state the name of such maker or makers of gauges as you have a knowledge of?
50. Is there any choice in regard to the position a gauge may bear to the boiler it is attached to? If so, state what it is.
51. Where should the gauge-pipe be taken from?
52. What is the tensile breaking strength of average boiler-plate iron per square inch of section?
53. Taking the strength you give above (52), what will be the bursting pressure on the cylinder shell of a boiler one-fourth of an inch thick and 48 inches in diameter, the plates to be supposed to be without a seam, and of equal strength throughout?
54. What percentage of the total strength of a boiler-plate is a single-riveted seam usually supposed to have?
55. What, with a properly laid out double-riveted seam?
56. What diameter of rivet would you use in a seam in ⅜-inch boiler-plate?
57. What distance would you give them from center to center in a single-riveted seam so as to secure the greatest strength to the seam, the shearing strength of the rivet per square inch of section to be taken at four-fifths the tensile strength of the plate?
58. What is meant by a "factor of safety" in boiler construction?
59. What would you consider a fair *factor of safety* in ordinary horizontal boilers?
60. Make a sketch of a "brace" such as you consider to be most suitable for the head of a shell boiler.
61. What is the strain allowable by the United States Steamboat Inspection Regulation on a boiler brace (or stay) of one square inch of cross section?
62. What pressure per square inch will a column of water 27 feet high, with a temperature of 40° Fahr., exert on a gauge? Answer approximately.
63. What is the greatest reasonable vacuum to be expected in the condenser of a low-pressure engine? Answer in inches of mercury.
64. Did you ever have charge of hydraulic elevators? If so, answer *yes*, and state the makers' names and what buildings they were in.
65. What is the "law of movable pulleys?" Only one answer.
66. If you have double blocks in a pulley, the upper block being fixed and the lower one movable, the cord or cable being fastened to the tail of the upper block, thence passing down to a sheave of the lower block, thence to the upper and lower blocks again, ending by hanging from the upper block, what weight on the single part of the cord will balance 40 pounds fastened to the tail of the lower or movable block (friction not considered)?
67. How far will the smaller weight or power move if the weight attached to the movable block is moved 12 feet?
68. If the distance from the surface of the water in the upper tank of a hydraulic elevator to the center of the cylinder is 100 feet, what will be the mean pressure per square inch throughout the stroke?
69. Did you ever have charge of a steam-heating apparatus? If so, state where.
70. Is there economy in using exhaust steam from high-pressure engines for warming purposes, even though you are forced to throw 2 pounds per square inch back pressure on the engine, assuming at the same time that you use all or a large quantity of the steam? Answer yes or no.
71. What is the effect of using Croton water in boilers?
72. If the water commences to fluctuate in your glass water-gauge, how will you proceed to prove your true water level without having recourse to your gauge-cocks, not knowing but they may be influenced by the same cause which affects the glass gauge.
73. Give a ready method for being always able to prove the correctness of your steam-gauge.
74. How many cubic feet of space should you have in your coal-bunker for each ton of coal to be stored? Answer approximately.
75. How many pounds of dry ashes should there be remaining after the burning of one ton (2,000 pounds) of good hard coal? Answer approximately. Only three answers.
76. Does wetting coal improve it or not for the purpose of making steam?
77. When is the best time to remove clinkers from the fire-bricks of a furnace, so as to do the least damage to the walls?
78. How many times greater in the area is a *three*-inch pipe than a *one*-inch?
79. What objection is there to using an iron-bodied cock with a brass plug for a blow-off cock?
80. How many kinds of toothed wheels are there?
81. Name them.
82. If two pulleys on opposite shafts are 20 feet from center to center, one pulley 12 inches in diameter and the other 36 inches, what will be the length of a belt to fit around them?
83. Did you ever have charge of a boiler that blew up?

Mr. Baldwin also furnishes us with some information as to the questions to which the fewest or no answers were received. Thus, to question 16 there was only one answer; to question 24, one; to question 25, one; to 32, no answer; to 33, one answer; to 34, only two good answers; to 36 only three answers; to 48, one answer; to 52, two answers; to 53, three answers; to 57, no satisfactory answer; to 61, no satisfactory answer; to 65, one answer; to 75, three answers. There were 21 candidates examined.

The switching locomotives in the Prussian service are being provided with a fire-extinguishing apparatus, by which they can be converted into fire engines at a short notice. This arrangement has already been tried in a few cases, and has proved itself of so much service that it is now to be applied universally. It is nothing new in this country.

The plan to have the New Orleans Exposition opened again next fall rests almost wholly upon the amount that can be raised by local subscription. The *Picayune* says: "The full sum of $270,000 is required, at all events, to even carry over the Exposition until the opening day, and this amount must be assured beyond a reasonable doubt before the people of New Orleans can announce to the world that the Exposition still lives." It does not look as though the Exposition will be revived.

We were recently shown a letter from L. S. Graves & Co., Rochester, N. Y., in regard to work being done by a Pond shafting lathe. They had been using one of those lathes (30″ swing) a year, and during a 7½ hours' run turned 2″ shafting, well finished, at the rate of 315 feet a day. They expressed the opinion that they could finish 2½″ shafting at same rate of speed. Two years ago we had a discussion in these columns about the speed at which good shafting could be turned. Of those who gave actual experience, Thos. Shanks & Co., of Johnstone, Scotland, took the lead. Since then builders of American shafting lathes have been looking to increased capacity, and the instance we have here noted seems to indicate progress in that direction. We should be glad to hear from others as to rapidity of turning true shafting—not speculation, but actual practice under ordinary conditions.

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NEW YORK, JUNE 27, 1885.

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Mechanics' Societies.

The usefulness of engineers' societies in the way of direct benefit to the members individually, suggests the benefits that the members of almost any trade could secure to themselves by the formation of clubs, meeting regularly for the discussion of matters pertaining to their everyday work. Such clubs could, by a little exertion on the part of a few men in any trade, be formed in almost every city in the country, since unlike societies of engineers, it would not be necessary to seek membership from a large section of the country.

In a city like New York, for instance, there are machinists enough to start a half dozen clubs, each with a membership equal to that of the Society of Mechanical Engineers. Clubs of this kind could be started in a modest way, involving little expense, the meetings being quite informal, and eventually come to meet as regular societies, at which meetings papers could be read and discussed, and business pertaining to a society transacted.

The kind of machine some one designed, or the overcoming of some engineering difficulty, is no more important to the members of an engineers' society than a hundred things pertaining to the best way to do the work necessary to construct the machine, in the pattern shop, foundry and machine shop is to the pattern-maker, foundryman and machinist. Nor is it of more importance to society. The burden of the cry of economists in great manufacturing countries, like England, is not for better engineers, but for better workmen, better mechanics; and what is true in this respect in England is equally true here. Any means to this end should receive all necessary encouragement; one of these means, and an important one, is the formation of mechanics' clubs, or societies, more local in character, meeting oftener, but fashioned otherwise something like engineers' societies.

If engineers get broader views by contact with those who work differently from themselves to accomplish certain ends, why should not the same be true, even in a greater degree, of journeymen mechanics? If the country is benefited, as no one doubts, by the existence of engineers' societies, it would undoubtedly be benefited to a greater extent by the existence of societies of mechanics, at the sessions of which ways and means of doing work were discussed.

Mechanics are altogether too little disposed to uphold and make the most of themselves. Their standing would be bettered by membership in societies having for their object mutual advancement. The advantages of better facilities for finding out what others were doing, and how they were doing it, would repay them a hundred times for the time and money spent, and the advantages in the way of increased confidence, and the habit of expressing themselves, would be important.

Such societies should be complete in themselves, that is, the members should meet to talk themselves, not to be talked at by outsiders. There is knowledge enough amongst the men who would compose such societies. All that is needed is that the same means be taken to spread it and make it common that is taken by engineers and the members of other professions. Nothing would tend more to exalt mechanics and put them in the way of educating themselves than the formation, in every city and large town, of societies of this kind.

Steel Castings.

In the earlier days of steel castings manufacturers were inclined to favor their use in the place of parts usually made of forgings, but very generally became discouraged in their attempts because of a lack of uniformity in quality, and the great prevalence of blow holes and imperfections. But advances in the knowledge necessary to produce satisfactory work of this kind have been reasonably rapid, and the use of steel castings appears to be gaining ground every day. Prejudice, however, from early failures still keeps many from using steel castings for various purposes, who, had they never began their use until some of the worst difficulties in the way of making them had been overcome, would have been entirely satisfied with the results.

Their great convenience for crank shafts for small and medium-sized center-crank engines, early led to extensive trials of them for this purpose; but here, as elsewhere, they were not entirely satisfactory. These lacked the quality of uniformity, and occasional failures condemned the whole. As they are now cast, it is the opinion of many engineers of extended experience in such matters, that they are superior, in equal sizes, to forged steel shafts, being if not absolutely stronger, materially stiffer to resist springing than the latter. This consideration is important, as the springing of a crank shaft to an extent far within the limits of safety, so far as breakage is concerned, may be disastrous to the running qualities of an engine, especially to one running at high speed. We are told of some steam engine builders who have substituted cast steel cranks for forged ones, because by so doing they could secure the requisite stiffness, to do which otherwise, alterations to admit heavier cranks would have been required.

There is not much difference in the cost per pound as between the cast and forged steel shafts, but the weight of the forging is considerably more than that of the casting, and a good deal of work is required to bring the forging into shape to be finished as quickly as the casting.

Steel castings are not yet made entirely free from blow holes, but great improvement has been made in that direction, and more may be expected.

A reader sends us an inquiry about some work mentioned by a correspondent and adds: "I would like more information or less talk. When they tell us how they do such and such jobs, it starts us all to studying for a better way. When they tell what they have done, it is only a matter of news, and perhaps nothing new at that." His strictures are well meant and deserve attention. It is important to know how certain mechanical results are reached, and often a correspondent leaves out the very information most desired when intending to describe a process so it can be followed by reading his description. It is not often that a correspondent makes his meaning *too* plain by noting all the details of a process.

Sticking to the Prison Contract System.

In Sing Sing prison Perry & Co. employ 929 convicts in making stoves, and they make 300 stoves a day of various sizes and patterns. According to a pamphlet prepared and circulated by Mr. Perry, convict moulders produce 47 per cent. as much as citizen moulders. The contract price for the convicts is 65 cents a day each. Thus the citizen moulders must work for $1.38 a day in order to compete with Perry's prison foundry. Competition in these times means all that the word implies. It means to the workmen that wages must be cut down to make the product cost less, so as to be sold at a low price. It is useless to contend that the number of convict moulders is small when compared with the whole number of citizen moulders. One large establishment can compel a reduction of prices in dull times, besides which the ratio borne by convict moulders to citizen moulders has increased because of the idleness of so many of the latter. The overwhelming majority against continuing the present contract system given by the citizens of this State at the ballot-box two years ago ought to have caused the necessary legislation, but it has not. The prison contract ring has been enabled to sway the legislature as well as a large number of newspapers. A majority of the last legislature decided that if the contract system could not be kept up, either by the day or by the piece, the convicts should remain idle when existing contracts expire. The Governor stood in the way of the former plan and the latter was adopted. Most of the members of that legislature should be emphatically retired to private life should they again come before the people for election, and their places filled by men who will pledge themselves to abolish the contract system and provide full employment for the convicts.

Strikes are very numerous this year, and present prospects do not seem to indicate any diminution of the number. Many politico-economic philosophers ascribe a large part of the present business depression to the prevalence of strikes. In reality most strikes are caused by the depression. Manufacturers in some lines, notably the owners of carpet mills, have shaped their policy so as to encourage strikes and decrease production, while throwing the onus of the rupture upon the workmen. Such a policy has almost been worn threadbare by mine owners. As soon as wages in all prominent industries have a decided tendency to advance we shall have much fewer strikes.

An Unjust Tax.

We have been shown a letter to Wm. H. Weightman from the private secretary of Governor Hill, of the State of New York, saying that in compliance with Mr. W.'s request, he had signed the bill in relation to boilers, thus making it a law. There was some opposition to the bill. It applies to New York city, repeals the present law requiring every licensed engineer to pay $2 a year to the police pension fund, and enacts that the owner of every steam boiler shall pay $2 a year to that fund. The engineers have with one accord opposed the law as it now stands. There was no just reason for taxing them to make up a police pension fund, nor can we see any good reason why boiler owners should be taxed for the same purpose. Owing to the efforts of Mr. Weightman and others the engineers are free from that imposition. It will be in order for boiler owners to convince the next legislature of the injustice of the tax.

A series of papers on modern locomotive construction, by J. G. A. Meyer, begins in this week's issue of the AMERICAN MACHINIST. Mr. Meyer is experienced in building locomotives, and is connected with a well-known locomotive works. He does not write from the standpoint of a theorist, but will present facts that have been developed in modern railroad practice. The papers will interest both professional designers and young designers. They will be intelligible to any mechanic.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(195) A. B., Florence, Wis., asks: Is there a reward offered by the United States Government for the invention of perpetual motion? *A.*—No.

(196) Engineer, Chicago, Ill., asks: Do the Nathan & Dreyfus oil cups, such as are used on steam chests of locomotives, feed oil only when the engine is shut off, or will they feed when running? *A.*—Our experience with these cups is that they will feed at both times.

(197) F. U. P., Baraboo, Wis., asks: Why are the holes in the arms of an American locomotive drilled so that when the top hole stands on a perpendicular line with the center of the shaft, the bottom hole will be ¼" ahead of the same line? *A.*—It is because the valve seat and the central line of motion of the link motion are not in the same plane. The lower arm of the rocker should be at right angles with the central line of motion of the link motion, and the upper arm at right angles to the motion of the valve, when the valve is at mid-stroke.

(198) J. A. B., Jeanerette, La., asks: 1. Given a rotary pump twelve inches diameter, six feet above water, and delivery nine feet above pump, pump making 225 revolutions per minute what is its capacity per minute? *A.*—You cannot calculate with any degree of certainty how much

water it will deliver. 2. How can I know what size of inspirator will be required for a 20 horse-power boiler? *A.*—You cannot make any calculations on it. The seller will tell you, or you can find out from the manufacturer's circular. 3. In what does a high-pressure boiler differ from a low-pressure one? *A.*—In being more strongly constructed. 4. Wishing to divide a circle into any number of equal parts, how shall I proceed? *A.*—We refer you to any elementary work on geometry. Much of the dividing of circles has to be done by trial, as with the dividers. You will find something on this subject in the AMERICAN MACHINIST of Dec 22, 1883.

(199) J. R., —— Mich., asks: 1. Is it true that, all other things being equal, more work can be performed by the use of the same amount of coal at night than in the day time, and can more work be got from a water wheel in the night time than in the day time? *A* —To both questions, No. 2. What is the best known record of fuel consumption for high and for low-pressure engines? *A.*—We cannot tell what the best trustworthy records are. Records for simple condensing engines may be found as low as 1¼ pounds of coal per horse-power per hour, and for simple non-condensing engines 2 pounds, or a little over. There are generally peculiar circumstances attending such records that leave ground for disputing them. 3. How are the exhaust valves of a Corliss engine made tight, since the pressure tends to force them away from the seat? *A.*—The seats of the exhaust valves of a Corliss engine are not against the cylinder ports, as you evidently infer, but against the exhaust passage, and the pressure in the cylinder tends to hold them to their seat. 4 Why is tallow used in making wiped joints, and what is the effect of using rosin on brass? *A.*—Tallow is used because it is the best flux for the purpose. Rosin is good for brass. 5. Are the proportions of tin and lead used in making plumbers' solder by weight? *A.*—Yes. 6. What is the best heat to have the solder when applying to a joint? *A.*—So it will flow readily. You can only learn this by practice.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Curtis Pressure Regulator and St'm Trap, June 6, p 13

Edw. Sears, wood engraver, 48 Beekman, St., N.Y

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Tools for amateur and foot-power lathes. Send for illustrations. Hartford Tool Co., Hartford, Ct.

Light fine interchangeable mach'y to order. Foot lathe catalogue for stamp. E. O. Chase, Newark, N.J.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W.F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

We will close at forced sale twist drills, taps, etc.; order early. York & Burton, Cleveland, O.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C. C. Hill, 84 Market st., Chicago, Ill

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co, 62 Chatham St., N. Y.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co., Collinsville, Conn

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Farley's Reference Directory of the Machinists, Iron, Steel, and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught," $4. Books for workmen Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free. Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass

Locomotive Engine Running and Management. By Angus Sinclair. Price $2. An excellent book for men interested in steam engineering, valve setting, designing valve motion, the care of the Westinghouse brake, etc. Published by John Wiley & Sons, 15 Astor Place, N. Y.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo. edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent. on orders for five or more copies.

An article in *The Sanitary Engineer* of June 4 gives some valuable data for engineers and boiler makers, in the shape of illustrations of twenty-five boiler heads, and a table showing the number and size of boiler tubes that can be put in a given size boiler head, with the square feet of heating surface to each boiler. Single copies of newsdealers, 10 cents Subscription, $4 per year. Published weekly at 140 William Street, New York.

MANUFACTURES

All but one of the coke furnaces of Alabama are in blast.

The Michigan Iron Works, at Cadillac, will soon be started again.

Corsicana, Texas., has sold $80,000 of bonds to build water works.

H. Mills will erect a $6,000 factory at 189 Orchard Street, Detroit, Mich.

W. D. Lathrop & Co., Elizabeth City, N. C., are building a cotton seed oil mill.

G. Glueck & Son, Minneapolis, Minn., will build a $10,000 addition to their factory.

David C. Carlton, 208 East 126th Street, New York, will build an iron railing factory.

Jas. H. Butler, 252 East 122d Street, New York, will erect a $65,000 carriage factory.

The Temple Pump Company, Chicago, will erect a $15,000 factory at 17 Meagher Street.

An addition to foundry, 24x36 feet, will be built at 1235 North Front Street, Philadelphia.

It is rumored in Birmingham, Ala., that a railway car manufactory is soon to be established in that city.

The Union Manufacturing Company, Battle Creek, Mich., is a new company that will start a machine shop.

It is stated that Oliver McIlhenny, Athens, Ga., will build a cotton seed oil mill and fertilizer factory.

It is said that a New York company manufactures every day 1,800 bustles stuffed with renovated antelope hair.

T. De Witt & Son, 1,211 DeKalb Avenue, Brooklyn, N. Y., will erect a two-story factory, 26x103 feet, to cost $7,900.

The Suffolk Manufacturing Company, of Boston, will erect a 40x100-foot factory on H Street, corner of First Street.

Sellmayer & Cingrass are preparing to start a wood-working and furniture manufactory in Shreveport, La.

The Toledo (O.) Locomotive Improvement Company will build a two-story addition to factory, at a cost of $2,500.

J. Eavenson & Son, Newbold Street, above Wood Street, Philadelphia, will build a 30x45-foot addition to their factory.

Greenleaf & Son, Starks, Me., will erect a factory for the manufacture of all kinds of wire household and farm utensils.

The Jewel Manufacturing Company, Toledo, O., will build a three-story factory, to cost $15,000. It will be 40x100 feet.

W. H. Bilyen, of Philadelphia, is contractor to erect a three-story factory, 20x79 feet, on Canal Street, above John.

S. A. Ilsley & Co., Brooklyn, N. Y., will erect on York Street, near Adams Street, a five-story tin factory, to cost $12,000.

The machine shops of Ward, Stanton & Co., Newburg, N. Y., which firm failed last Fall, will be reopened by James Bigler.

Two Worthington steam pumps, of 2,000,000 gallons capacity each, will be used for the new water works, Lampasas, Texas.

A. Beck, Philadelphia, has a contract to erect a 53x103-foot factory, four stories high, on Wharton, west of Fifteenth Streets.

The Dayton (O.) Screw Works have been sold to the Russell & Erwin Manufacturing Company. The capital of the new company is $300,000.

Milholland & Penney, McKeesport, Pa., will at once commence to erect a foundry and machine shop, which they will operate at above place.

H. K. Porter & Co, Pittsburgh, Pa., makers of light locomotives, have received another order for locomotives from the Panama Canal Company.

The June Manufacturing Company, Chicago, is working on a large order for improved ratchet drills for the Chicago, Burlington & Quincy Railroad

The Acme Co-operative Barrel Company, of Minneapolis, Minn., has been incorporated to manufacture all kinds of barrels, tubs, etc. Capital, $10,000.

A co-operative shoe factory is proposed to be started in Brooklyn, to be operated by the girls who lost their situations in Brennan & White's shop.

J. G. Truitt & Co. will probably establish a factory in Lagrange, Ga., and possibly in other places in the South, to manufacture Brook's cotton planter.

The Madison Woolen Company, of Portland, Me., will build a four-story brick and stone mill at that place. Work will be commenced as early as possible.

The large clothing firm of Wanamaker & Brown, Philadelphia, has been incorporated, with $400,000 capital, to manufacture cloth and clothing in Camden, N. J.

Our contributor, Frank H. Richards, of Troy, N. Y., writes us that the electric lighting company of that city have ordered three straight-line engines for their incandescent lights.

The Rhode Island Locomotive Works have completed all the thirty engines ordered by the Brooklyn Elevated Railroad. We illustrated this engine in our issue of February 28, 1885.

The H W. Johns Manufacturing Company, of this city, captured a first-class medal at the New Orleans Exhibition for their asbestos roofing, building felt, plastic stone lining, and retort cement.

Mackintosh, Hemphill & Co, Pittsburgh, Pa., have the contract to erect the entire Bessemer steel plant for the Laughlin & Junction Steel Company. It includes the machinery as well as the buildings.

The weavers of Frankford, Philadelphia, have organized a co-operative company for the purpose of producing textiles in cotton, wool, and silk. The capital stock is fixed at $20,000, in 400 shares at $50 each.

The contract for building the pumping engines and foundations for Lansing, Mich., water works has been awarded to Henry R. Worthington. The Lansing Iron Works have the contract to furnish the boilers.

The Somersworth Machine Company, manufacturers of stoves and hollow-ware, are about to erect a new moulding shop, carpenter shop, and pattern room; also iron and coal storehouse at Salmon Falls, N. H.

The Manhattan Hardware Works, of Reading, Pa., and the Reading Land and Improvement Company have failed to come to any agreement respecting a new location for the works of the former concern on the land of the latter.

The American Watch Company, Waltham, Mass achusetts, now have over 2,300 employes on their pay rolls, and they are working on full time. Their production now is nearly two watches for each working minute during the week.

Warren, Mass., is likely soon to have an addition to her manufacturing industries in shape of a company to make an improved water filter and shoe machinery, as a number of citizens have furnished the desired capital, $20,000.

The Belmont Stove Company have purchased the Co-operative Foundry and Stove Works, at Martin's Ferry, O., and now offer for sale all the foundry tools, machinery, patterns, flasks, and everything connected with a thoroughly fitted foundry.

A contract has been awarded the M. C. Bullock Manufacturing Company for supplying the Baker Manufacturing Company, of Evansville, Wis., who are enlarging the windmill department of their works, for a very large straight-line engine.—*Industrial World.*

The Niles Tool Works have just shipped a 6-foot boring and turning mill (weight, 26,000 pounds) to St. Petersburg, Russia. Many of these machines have already been sold to different parts of Europe by the Niles Tool Works, and their merits have been well recognized

The Babcock & Wilcox Company, 30 Cortlandt Street, New York, have issued a new edition of their pamphlet, entitled "Steam," which has been enlarged and considerable valuable engineering information added. It is well illustrated with good wood engravings.

The Dow Wire Works Company, Louisville, Ky., have purchased the stock and machinery of the Southern Wire and Iron Works Company, and contemplate establishing wire works to employ about $40,000 capital, in some southern city.—*Baltimore Manufacturers' Record.*

The Covered Tube Cable Railroad Company, of Brooklyn, N. Y., has been incorporated for the purpose of using patents of Alexander H. Mathesius for cable railways. Capital stock, $500,000. Daniel B. Thompson, Alexander H. Mathesius, and Carstan Tiedemann, Trustees.

Currier & Snyder, Worcester, Mass., whose new upright drill we illustrated last week, make their 25″ drills to weigh 1,500 pounds, and 28″ drills 2,200 pounds. They are well made and give good satisfaction. Selling agents are A. J. Kirkwood, Chicago, and Geo. Place Machinery Company, New York.

The Cleveland Twist Drill Company, Cleveland, O., have issued a new catalogue of twist drills, reamers, taps, and cutters. It contains several new price lists, also a table of the safe speed of drills, compiled from statistics furnished them by about 500 leading manufacturers. They have added lathe drills to their list of manufactures, and are having a good demand for them.

Business at the Brattleboro Sewing Machine Company's shops in Centreville is reviving, and the force of workmen, now about thirty, is daily enlarging. Orders for machines of the new Esty-Fuller model are now far ahead of the company's ability to supply, and it is the purpose of the management to immediately increase their monthly output to 400 or 500 machines.—*Vermont Phœnix.*

Some months ago the machine shop of the Whitcomb Manufacturing Company, Worcester, Mass., was burned out, most of the tools being destroyed. The shop has been reconstructed and refitted mainly with new tools. Their specialty is the Whitcomb iron planer, which has been before the mechanical public for many years. They are fully prepared to supply orders for planers, with even better facilities than before the fire.

Edward G. Hewitt, paper dealer, 48 Beekman Street, New York, will erect a two-story factory, to cost $4,000, on Lafayette Avenue, near Classon Avenue, Brooklyn, N. Y.

A number of Michigan capitalists are forming a company, called the "Promoters' Association of the Edison Electric Light," for the purpose of lighting all the principal cities in the State with electricity. They want $1,000,000 capital, and are receiving a great deal of encouragement. Companies are to be formed in towns, and the Promoters' Association will supply the necessary money to set them going.—*Grand Rapids Morning Telegram.*

The Consolidated Safety Valve Company, of Boston and New York, held its annual stockholders' meeting on the 3d inst., and the following board of directors was elected: Chas. A. Moore, E. L. Maxwell, George W. Richardson, C. E. Maxwell, Henry S. Manning, W. W. Rousseau, and Martin Luscomb; and at a subsequent meeting of the directors Chas. A Moore was elected president, Martin Luscomb treasurer and secretary, George W. Richardson superintendent, and H S. Manning assistant treasurer.

In the shops of the Pond Machine Tool Company, Worcester, Mass., we noticed last week a new 6-foot boring and turning mill, nearly completed. These mills will be built in sizes from six feet to sixteen feet, as soon as patterns can be finished. We also noticed a new 5 foot radial drill under way, and were informed that a full line of radial drills will be made. A new axle lathe of solid construction also claimed attention, One of their new suspension drills was at work boring accurate holes. It has few parts, and can be easily operated.

Preston & Heermans, Corning, N. Y., write us: "Our new foundry and boiler shop are to be of brick, under one slate roof, and entire size of whole building 146x70 feet. Expect to have the whole thing completed by September 1. Our machine shop, smith shop, and pattern storehouse are of brick, and were not destroyed by the fire of April 10, as were the foundry and boiler shop. What few new tools we require will be mostly of our own make The number of men employed by us now is 37. We have the lease of another foundry, which we use during the construction of the new, and our boiler work is also uninterrupted.

A daily newspaper should always publish important industrial information as soon as it obtains it. The *Springfield Republican* of June 5 has the following item: "A Hartford mechanic has patented an automatic screw machine which promises to be a remarkable invention. It turns out finished screws from round or square wire, and from twenty to thirty machines can be operated by one man. The first machine made turned out over 2,000 screws a day, and it is expected it will turn out 2,500 screws an inch long a day" The machines have been running for several years in the works of the Hartford Machine Screw Company. Of course, improvements are occasionally made.

Bement, Miles & Co., Philadelphia, Pa., recently shipped to the DeLancey Forge and Iron Company, of Buffalo, a 5-foot swing lathe, with a bed 70 feet long. The front journal of the spindle had a diameter of 11 inches. Notwithstanding the reputation for plenty of metal that the Bement tools have always had, the fact is noticeable that in their more recent designs the weight is almost universally further increased. There is a probability of their bringing out a new milling machine, with some novel features of construction designed to avoid springing when on hard, heavy cuts; there is also some talk of a new automatic gear cutter for large wheels. They use on their regular work four automatic gear cutters for ordinary and small wheels. Considerable general work outside of tool building was noticed in their shops, notably parts of a machine for making concrete blocks. It might be thought that rough machinery would be used for such work, but, on the contrary, the dies in which the blocks are formed are remarkable for their accuracy, and for the manner in which the steel parts of which they are composed are made interchangeable.

At the works of the Southwark Foundry and Machine Company, Philadelphia, a representative of the AMERICAN MACHINIST was recently informed that they had more work on orders in progress than for any time during the past seven years. On the floor, just completed, stood probably the largest pair of centrifugal pumps, with engines complete, ever built in this country. They are for the Government dry docks at Mare Island. Each pump is capable of handling 40,000 gallons of water per minute. The total weight of machinery furnished on this order (which does not include boilers for the plant) is about 300,000 pounds. A number of both the Porter-Allen and "Southwark" engines are in process of construction. One of these, of the first-mentioned type, is a 44″x48″, for the Cambria Iron Company; one of the same size that went through the fire is being rebuilt for the Lackawanna Iron and Coal Company; a pair of large reversing engines are building for the Benwood Steel Works, of Wheeling, W. Va.; a large contract for purifiers for the Consumers' Gas Company, of Chicago, is being filled; also a large order for miscellaneous machinery for the Pottstown Iron Company. The Southwark Company are progressing rapidly with the re-equipment of their boiler shop—one of the largest in the country—with modern hydraulic and other machinery for doing boiler and heavy sheet metal work. The Southwark shops are amongst the best equipped in the country, not only for steam engine work, but for a general run of heavy work.

Duffy, Trowbridge & Co., Quincy, Ill., are running their stove foundry to its full capacity, and are about to materially enlarge their premises. At present they are employing 60 men.

Seth Braggins, of Rochester, N. Y., has made arrangements with the Rochester Machine Tool Works, of that city, for manufacturing and putting upon the market the "Braggins Automatic Safety Engine" of one and two horse-power, and larger sizes as soon as the market demands, under his patent of May 26, 1885. The Rochester Machine Tool Works will still, however, continue the manufacture of their line of machine tools.

The York Iron Company is a new corporation of Minneapolis, Minn., which will shortly erect a charcoal blast furnace on its ore and timber lands at Black River Falls, Wis. The furnace is to be 53 feet high by 10 feet across the bosh. The company, being finely situated, does not expect to stop with the manufacture of pig iron. Mr. James E. York, formerly of Portsmouth, Ohio, and Birmingham, Ala., is vice-president of the company, and Mr. Otis A. Pray, of the Pray Manufacturing Company, Minneapolis, is treasurer. Mr. Horace E. Burt will manage the works and mines at Black River Falls. —*Bulletin of the Iron and Steel Association.*

Machinists' Supplies and Iron.

NEW YORK, June 11, 1885.

There are no indications of a change in the supply business from the rut of inactivity into which it has settled. With money in abundance, the only settled fact is that consumers will buy nothing in the way of supplies except to supply immediate and imperative wants.

In iron trade circles the most important topic is the disagreement as to price between workmen and manufacturers. But it is hardly probable that this will tend to any noticeable extent to stiffen prices. Consumers will not buy for future use until evidences of advance in price is more probable than at present, and anything that occurs to unsettle iron business, like disagreement as to wages, only tends to make them more conservative.

Standard brands of American pig are held firm at: No. 1 X Foundry, $18; No. 2 X Foundry, $17. In other brands, asking prices are shaded so extensively that correct quotations are impossible. Grey Forge is held at furnace at $14 50 to $15.50.

Scotch Pig—The market is quiet, and transactions are in small quantities only. We quote: Shotts, $20.50 to $21; Coltness, $20.50 to $21; Gartsherrie, $20.50; Summerlee, $20 to $20.50; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $20 to $20.50; Dalmellington, $18.50 to $19.

Copper—The market for ingot is quiet but fairly steady. Lake is held at 11½c., with 11.30c. bid; other brands, 10.40c. to 10.60c.

Lead—Prices have ruled steady at 3.65c.

Spelter—Refined, 8c. to 8¾c.

Tin—There is but little demand for tin. Prices in London have again declined, and buyers take only small lots. We quote: Banca, 20c.; Straits and Malacca, 19c., asking prices.

Antimony—Hallett's, 9¼c.; Cookson's, 9⅝c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

An experienced man desires an engagement with some live company as superintendent; best references as to ability. Address Progress, AM. MACHINIST.

Wanted—Wood and brass pattern-makers; only first-class men need apply. The United Brass Company, Lorain, Ohio.

A first-class salesman would like to represent a good firm; well acquainted, and good mechanic. Address Business, AM. MACHINIST.

Wanted—Position as traveling salesman; well educated, 10 years' experience in iron business. Address H., care AM. MACHINIST.

If you want first-class machinist and toolmaker as superintendent or foreman on light machinery, address me. Highest references. "E.," 653 W. Harrison Street, Chicago, Ill.

Wanted—Immediately, a first-class man in every respect, fully competent to act as foreman in charge of shop for building tools and machinery. Address B., BOX 4, AM. MACHINIST.

Practical pattern maker, experienced in marine, general foundry and machine work, wants position as foreman; locality no objection. J. G., 285 Kosciusko Street, Brooklyn, N. Y.

Wanted—At once, a first-class tool maker for work on drill chucks; give references, experience; state wages expected. Graham Manufacturing Company, Galt, Canada.

Wanted—New York boy, residing with parents, who has practiced mechanical drawing. Wages small to begin with; good opportunity to learn. Address "Drawings," care AM. MACHINIST.

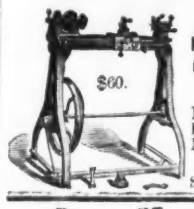
Wanted—By an experienced German wire nail maker, to join some party to start the manufacture of all kinds of wire nails and wire tacks. Address "Wire Nail," AM. MACHINIST.

Wanted—A machinist used to lathe, planer, and vise work; also a millwright to put up shafting, and a good framer and pattern maker. Address A. A. Cary, Jr., 234 West 29th Street, N. Y.

To make room for larger tool, will sell cheap, for cash, a planer 42"x42"x12', in good order. Address P. O. Box 2085, Bridgeport, Conn.

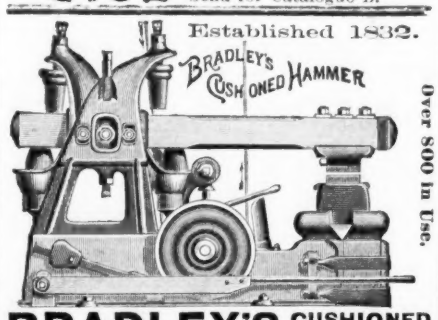
For Sale—A Crosby Improved Nickel-Plated Indicator, with 40 and 50 Springs and scales; been used but a short time, and in first-class condition. Price, $65, cash. Address BOX 2, AM. MACHINIST.

CHANDLER & FARQUHAR,
168 Devonshire Street,
BOSTON, MASS.

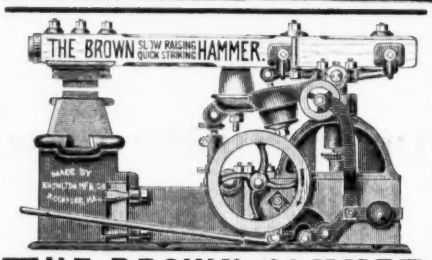


TOOLS AND SUPPLIES
FOR
Machinists, Plumbers, Gas Fitters, Electricians, Model Makers, Roller Skate Makers, Amateurs, Etc.
Send for Catalogue B.

Established 1832.



BRADLEY'S CUSHIONED HAMMER.
Stands to-day without an Equal.
It approaches nearer the action of the Smith's Arm than any Hammer in the WORLD.
SPECIAL NOTICE.
All parties making, selling or using an Upright or Helve Power Hammer having a Cushioned Vibrating Saddle, infringe our patents, and we shall hold them legally liable for the same.
BRADLEY & COMPANY, Syracuse, N. Y.



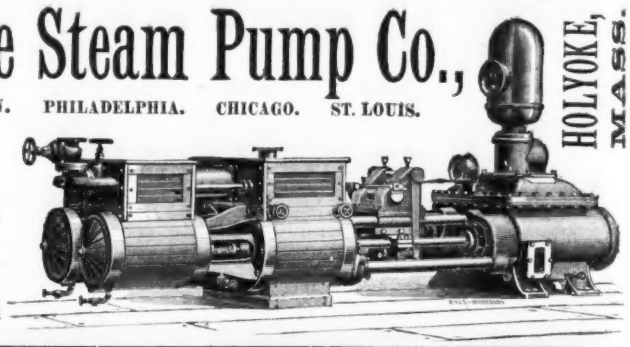
THE BROWN HAMMER
STRIKES A BLOW WITH
DOUBLE THE VELOCITY That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION.
KNOWLTON MFG. CO., King St., Rockford, Ill

The Fireman's Guide.
A Handbook on the
CARE OF BOILERS
By KARL P. DAHLSTROM, M. E.
Crown 8vo, Cloth, 50 Cents.
E. & F. N. SPON, 35 Murray St., New York.

STEPHENS PATENT VISES
50 Per Cent. of time and labor saved by using this solid, strong, durable, quick-working Vise. Has the improved taper, pipe and other attachments. Sold by the trade. Send for circular.
MELVIN STEPHENS, Prop'r, Office, 41 Dey St., New York.

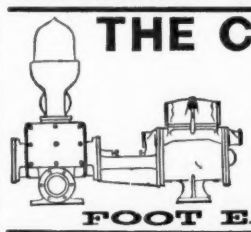
FOR SALE AT A BARGAIN.
A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,
A. FALKENAU,
Care of Dickson Mfg. Co.,
Scranton, Pa.
Only reason for selling, Ill health.

The Deane Steam Pump Co., HOLYOKE, MASS.
NEW YORK. BOSTON. PHILADELPHIA. CHICAGO. ST. LOUIS.
MANUFACTURE
PUMPING MACHINERY
FOR ALL DUTIES.
Send for New Illustrated Catalogue.



Established in 1874.
CLEVELAND TWIST DRILL CO.
24 and 26 West Street, Cleveland, O.
101 Chambers Street, New York.
85 Queen Victoria St., London, Eng.

THE CAMERON STEAM PUMP.
STANDARD OF EXCELLENCE.
30,000 IN USE.
MANUFACTURED SOLELY BY
The A. S. Cameron Steam Pump Works,
FOOT EAST 23d ST., NEW YORK.



ROOFING.
For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents wanted. T. NEW, 32 John Street, New York

PATTERN & MODEL MAKER.
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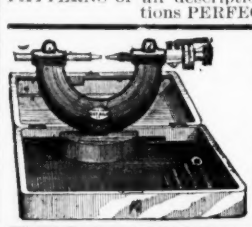

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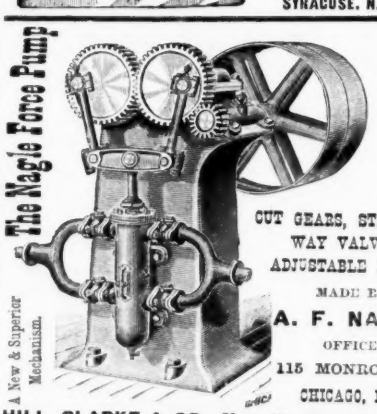

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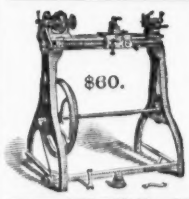

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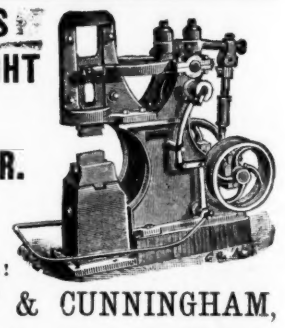

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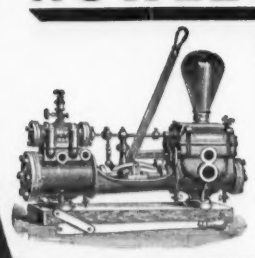

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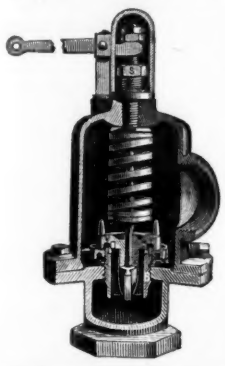

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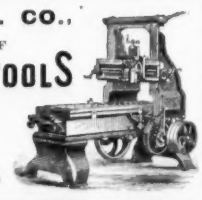

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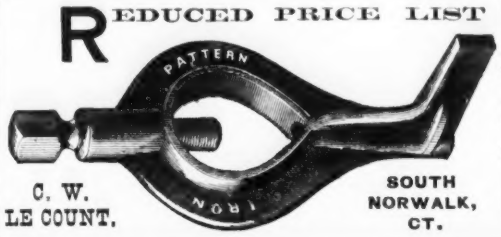

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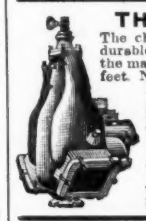

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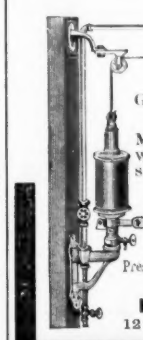

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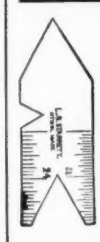

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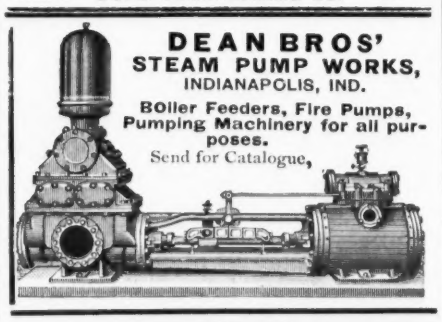

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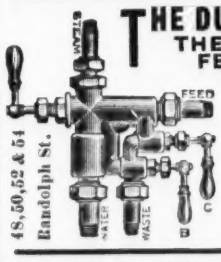

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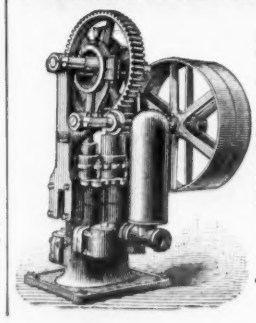

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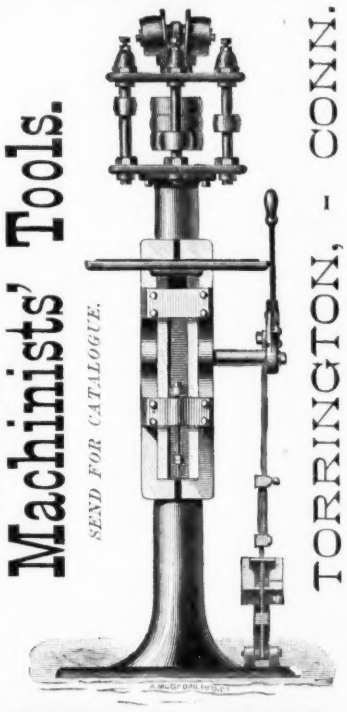

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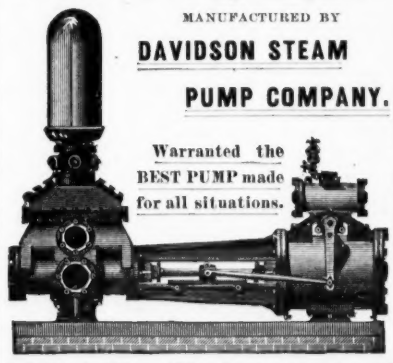

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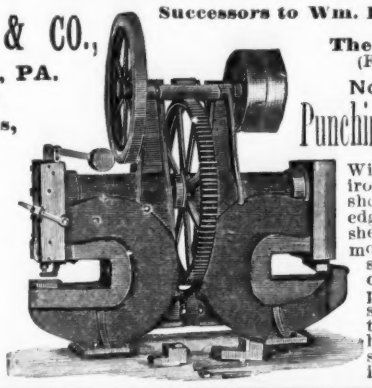

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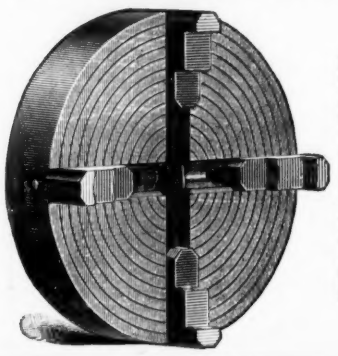

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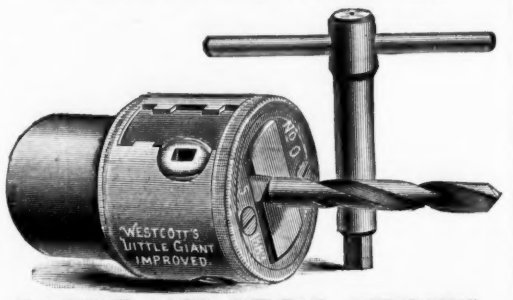

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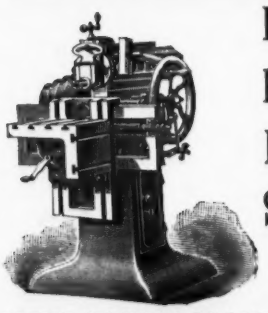

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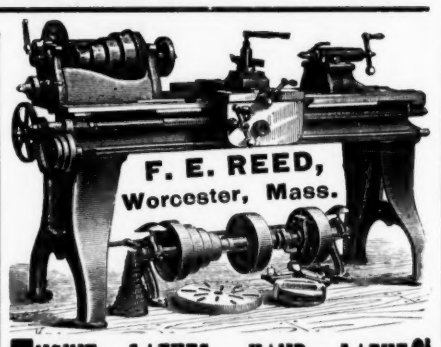

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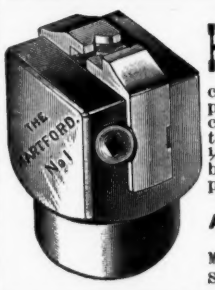

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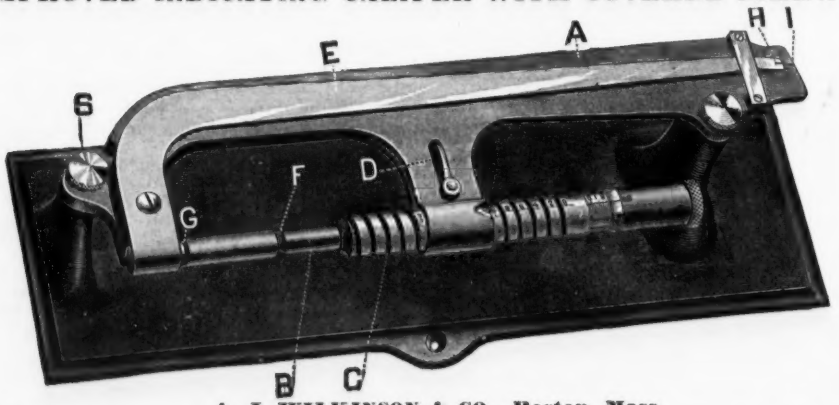

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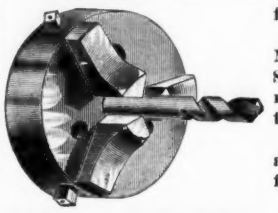

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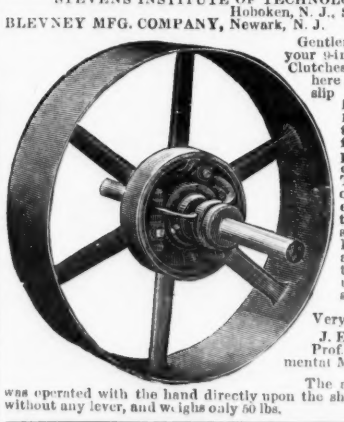

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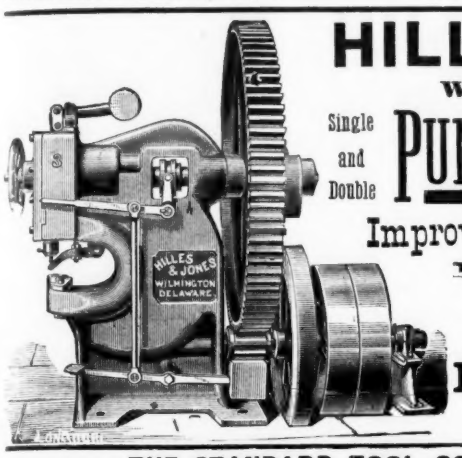

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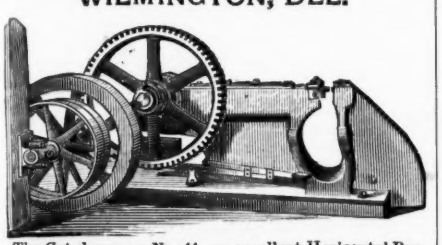

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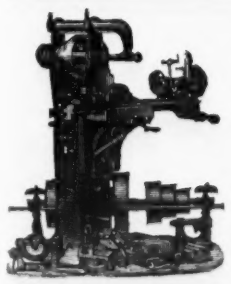

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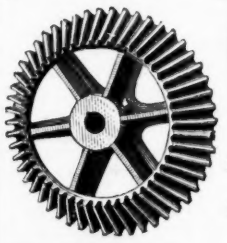

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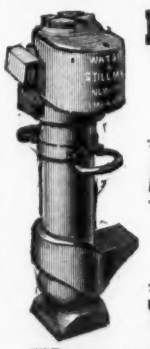

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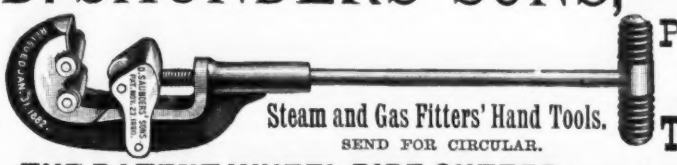

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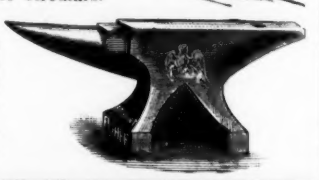

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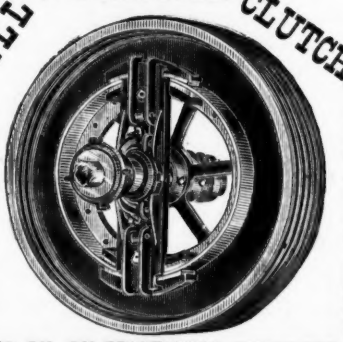

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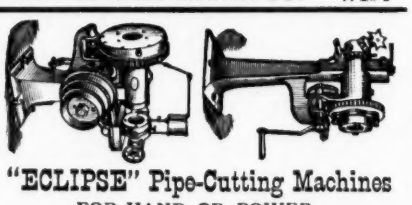

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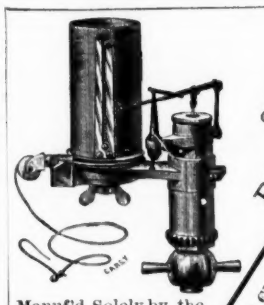

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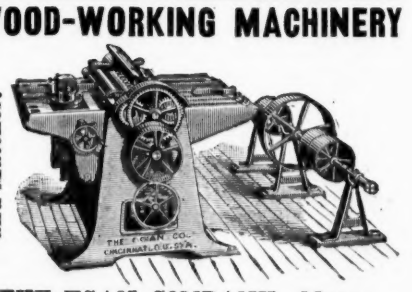

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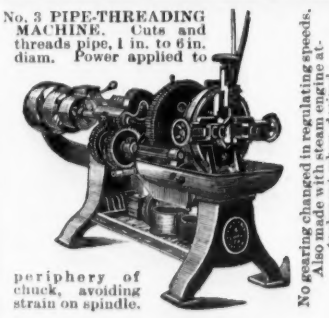

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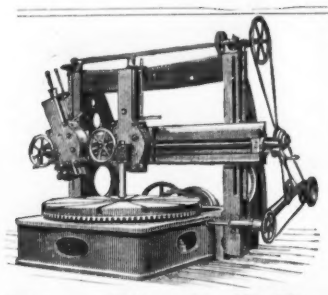

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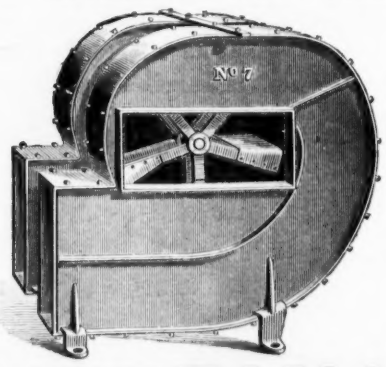

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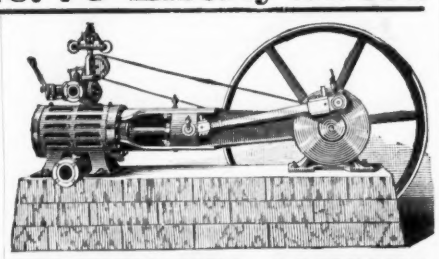

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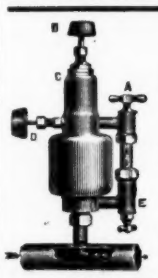

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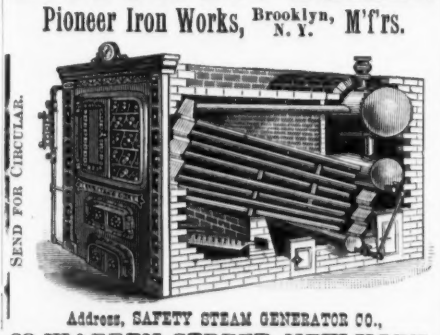

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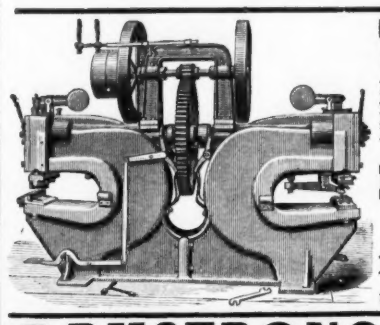

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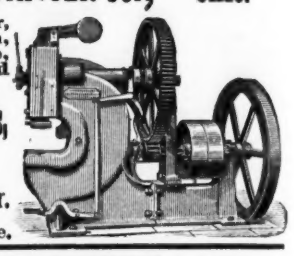

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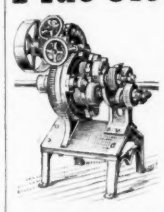

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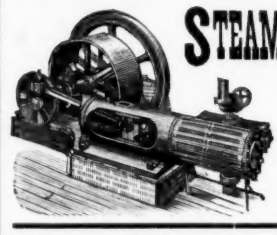

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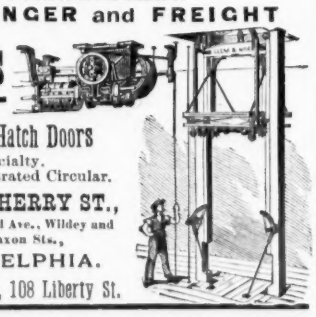

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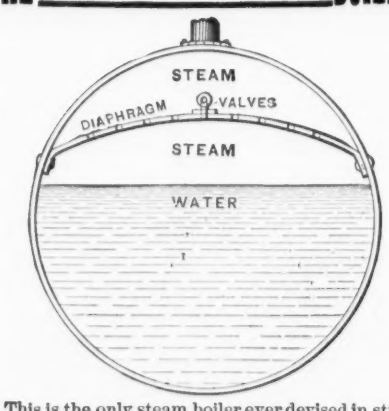

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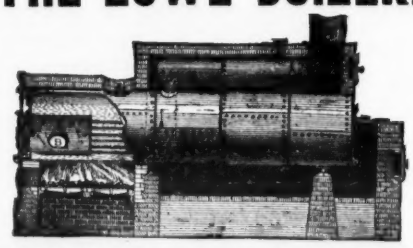

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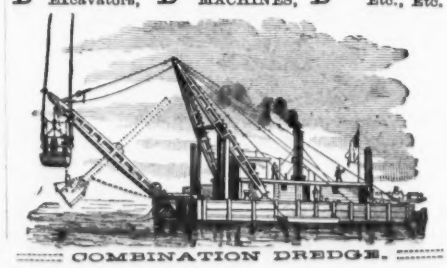

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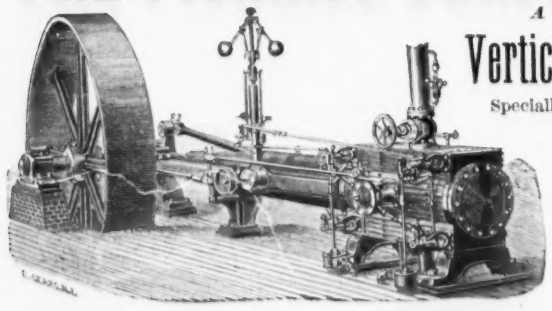

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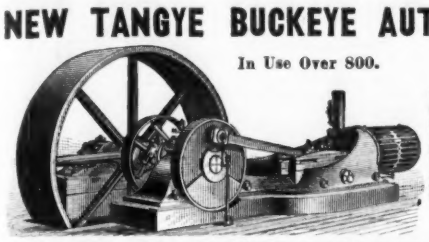

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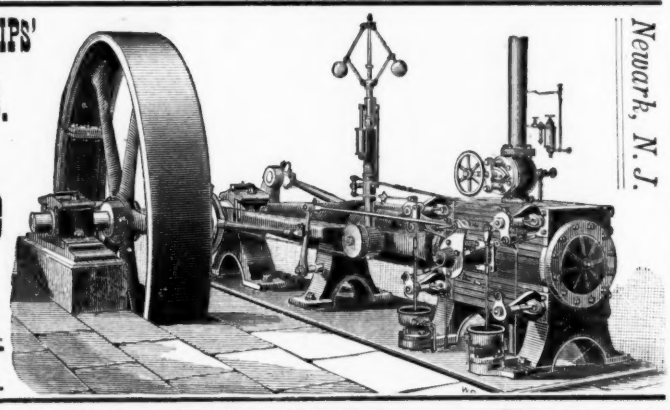

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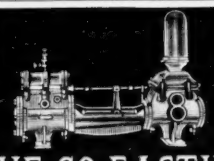

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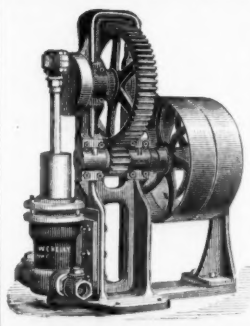

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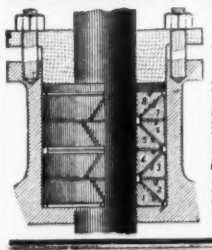

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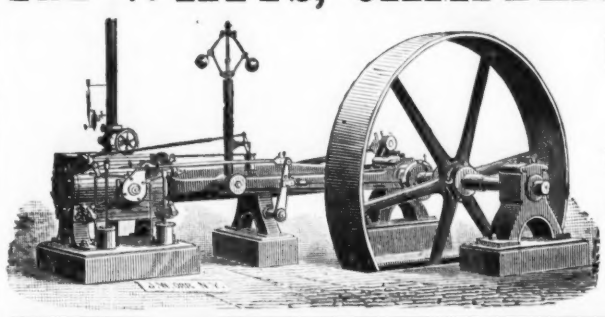

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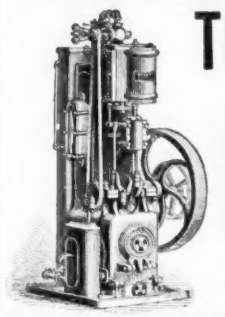

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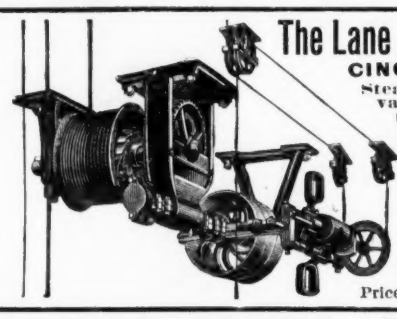

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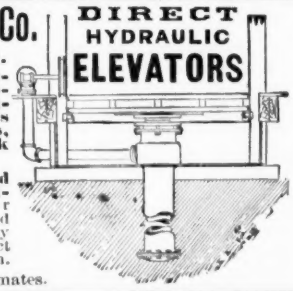

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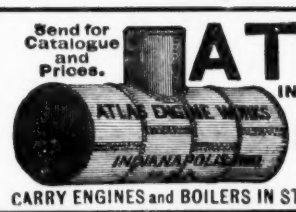

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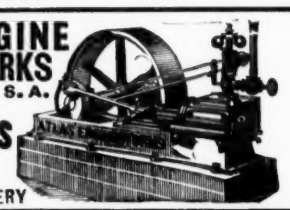

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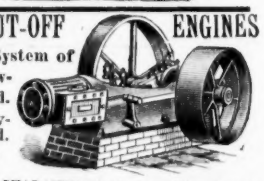

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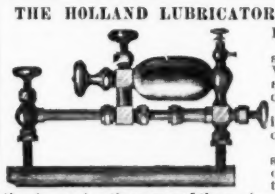

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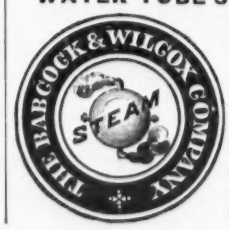

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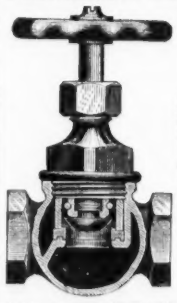

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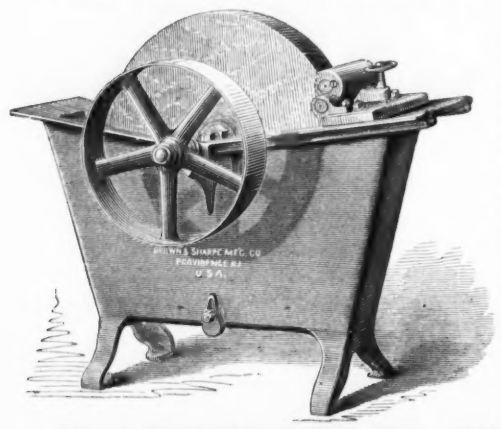

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Weight 600 pounds; with 40 inch stone, 1,000 pounds.

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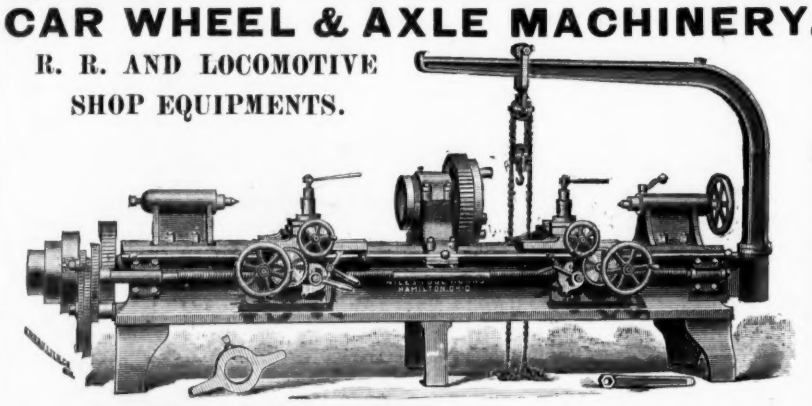

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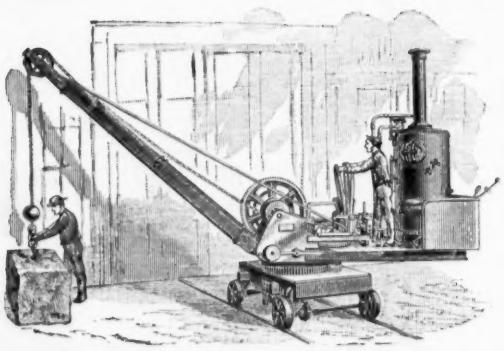

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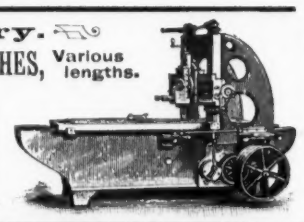

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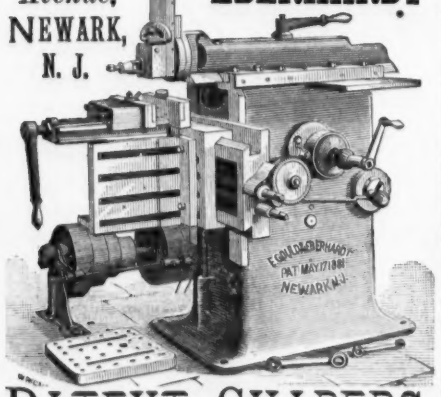

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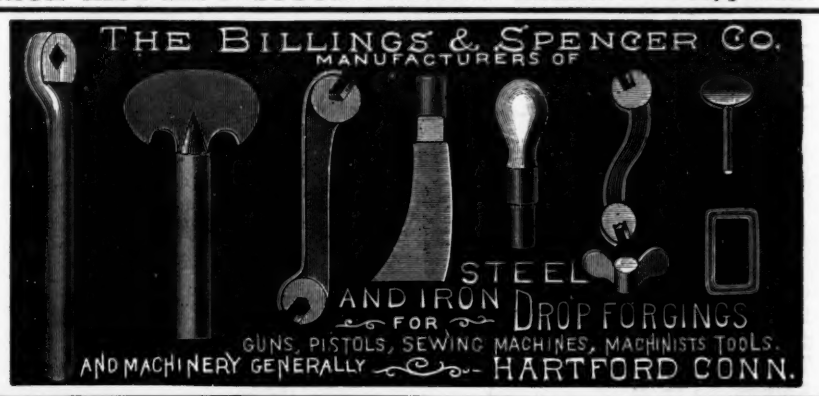

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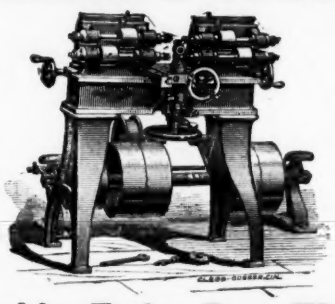

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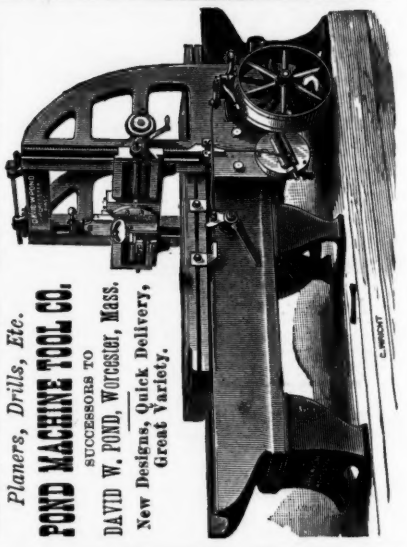

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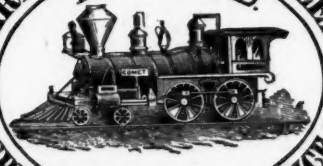

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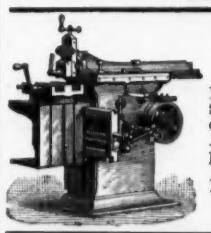

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